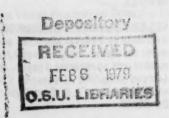
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VOLUME 12, NUMBER 1 JANUARY 1, 1979

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior



VOLUME 12, NUMBER 1 JANUARY 1, 1979

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he Secretary of the U.S. Department of the Interior has deermined that the publication of the periodical is necessary in the ransaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

WATER RESOURCES

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wild-life, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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FOREWORD ASSESSED

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

CONTENTS

REW	Water Resources Abstracts, a semimontilly and introduct from the ourset and
BJEC	T FIELDS AND GROUPS in sold in the mention of the mention of all and a subulant
	Please use the edge index on the back cover to locate Subject Fields and Indexes.
01	NATURE OF WATER Includes the following Groups: Properties; Aqueous Solutions and Suspensions
02	WATER CYCLE Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.
03	WATER SUPPLY AUGMENTATION AND CONSERVATION Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water Conversion and Municipal Use; Conservation in Industry; Conservation in Agriculture.
04	WATER QUANTITY MANAGEMENT AND CONTROL Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects or Water of Man's Nonwater Activities; Watershed Protection.
05	WATER QUALITY MANAGEMENT AND PROTECTION Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration Water Quality Control.
06	WATER RESOURCES PLANNING Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternative Ecologic Impact of Water Development.
07	RESOURCES DATA Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.
08	ENGINEERING WORKS Includes the following Groups: Structures; Hydraulics; Hydraulic Machinery; Soil Mechanics; Rock Mechanics and Geology; Concrete; Materials; Rapid Excavation; Fisheries Engineering.
09	MANPOWER, GRANTS, AND FACILITIES Includes the following Groups: Education—Extramural; Education—In-House; Research Facilities; Grants, Contracts, and Research Act Allotments.
10	SCIENTIFIC AND TECHNICAL INFORMATION Includes the following Groups: Acquisition and Processing; Reference and Retrieval; Secondary Publication and Distribution; Specialized Information Center Services; Translations; Preparation of Reviews.
SU	BJECT INDEX
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A.	CESSION NUMBER INDEX

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ABSTRACT SOURCES

SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

INVESTIGATIONS OF THE MOLECULAR WEIGHT, FREE RADICAL AND METAL INTERACTIONS OF ISOLATED AQUATIC AND SOIL FULVIC ACID, New Hampshire Univ., Durham. S. A. Wilson.

Resi

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 085, Price codes: A07 in paper copy, A01 in microficher PAD Dissertation, August 1977, 131 p, 11 fig. 7 tab, 113 ref, append. OWRT-A-035-NH(4), 14-31-0001-

Descriptors: "Humic acids, "Acidic soils, "Chemical reactions, "Fulvic acids, "Acidic water, Chemical analysis, Metals, Organic acids, Soil profiles, Podzols, Acidity, Spectrophotometry, Molybdenum, "Molecular weight, "Free radical, Cryoscopic analysis, Electron parametric resonance, Spin concentration, Vanadium.

Soil and aquatic fulvic acid were isolated from a 3 Soil and aquatic fullyic acid were isolated from a 3 horizon and a Podzol soil and the Oyster River in Lee, N.H., respectively. The isolated materials were characterized initially by total acidity, functional group (carboxyl, carbonyl), elemental (C,H,N) and UV-visible spectrophotometric analyses. The molecular weights of soil and caretic fully in this cold was determined to the cold was determined to the cold was determined to the cold was a cold with the cold was determined to the cold was determined aquatic fulvic acids were determined using a cryoic method analysis. Data were corrected for the dissociation of carboxyl groups. Dissociation corrected number average molecular weights of 644 and 626 were obtained for soil and aquatic fulvic acid, respectively. Additional studies were performed on the free radical specie associated with fulvic and humic acids. Electron paramagnetic resonance (epr) spectra for soil fulvic and humic acids reveal an unsymmetric first derivative signal with g-values of 2.0037 + 0.0002 and line widths of 3.3 to 5.6 Gauss. Analysis of the relative spin concentration revealed a free radical concentration pattern; soil humic acid, aquatic humic acid, soil fulvic acid, aquatic fulvic acid. Deoxygenated aqueous solutions of soil and aquatic fulvic acid were titrated with base to determine any change in the free radical concentration as a function of pH. The free radical signal showed a dramatic increase in intensity at pH values greater than 8. A Henderson-Hasselbalch equation was used to explain increases in the free radical concentration with pH. It was proposed that quinone and hydroquinone molecules interact to produce semiquinone molecules at high pH. W79-00436

2. WATER CYCLE

2A. General

MODELLING THE WATER QUALITY OF THE HYDROLOGICAL CYCLE. For primary bibliographic entry see Field 5B. W79-00379

A GENERAL TWO DIMENSIONAL RIVER SIMULATOR, Waterloo Univ. (Ontario). Dept. of Systems Design. For primary bibliographic entry see Field 2E. W79-00397

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00447

POTENTIAL AND LIMITATIONS OF RAIN-FALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS,
Papua New Guinea Univ., Port Moresby (New

Guinea). Dept. of Geography.

G. Pickup.

Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 87-102, 1977. 6 fig, 5 tab, 22 ref.

Descriptors: *Rainfall-runoff relationships, *Model studies, *Mathematical models, Watersheds(Basins), Rivers, Mountains, Rainfall, Storms, Precipitation(Atmospheric), Runoff, Foreign countries, Foreign research, Streamflow, Gaging stations, Stream gages, Rain gages, Calibrations, Hydrology, *Papua New Guinea, *Papua New Guinea Highlands.

A modified version of the Boughton model was calibrated for the Tua River Basin in the Papua New Guinea Highlands. The same model parameters then were used to calculate runoff from rain fall for 7 other basins to see whether it is possible to transfer model parameters between similar basins. Model parameters could be transferred successfully between similar basins where low flows are concerned, but higher flows were not al-ways reproduced successfully. (Sims-ISWS) W79-00491

2B. Precipitation

IS CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER., Illinois Univ. at the Medical Center, Chicago. For primary bibliographic entry see Field 5A.

OF CHRYSOTILE DETERMINATION ASBESTOS IN RAINWATER, Illinois Univ. at the Medical Center, Chicago. For primary bibliographic entry see Field 5A. W79-00014

A TECHNIQUE FOR ESTIMATING CLOCK TWO-HOURLY PRECIPITATION RATE DIS-TRIBUTIONS, Air Force Environmental Technical Applications

Center, Scott AFB, IL. D. J. McMorrow.

Report USAFETAC-TN-78-002, May 1978. 13 p, 4 fig. 6 tab. 21 ref.

Descriptors: *Metorology, *Rainfall, *Precipitation atmospheric, *Rainfall intensity, *Clock-hourly precipitation, *Clock two-hourly precipitation, *Precipitation intensity, Weather patterns, Microwaves, Weather data, Climatic data, Distribution patterns, Radio waves, Analytical techniques.

Because precipitation, particularly rainfall, is one of the most significant attenuators of microwave transmissions, accurate estimates of mean rainfall rate distributions along lines of varying lengths is desirable. A method for estimating rainfall distributions over long path lengths is described that shows how clock two-hourly precipitation rate distributions can be derived from distributions of clock-hourly precipitation rate distribution using negative exponential functions. The analytical

conversions are provided for 16 climatic regimes in the continental United States and Alaska. Also, the clock-hourly and two-hourly precipitation rate distributions are compared with instantaneous distributions measured over horizontal paths. Examination of the instantaneous rainfall rate distribution along lines in central Illinois indicated that the 1950 hypothesis of Bussey on the pointtime ergodicity of rainfall rate distributions may require some adjustment, although the basic assumptions appear reasonably valid. (Majtenyi-IPA) W79-00089

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, AN-NOTATED BIBLIOGRAPHY. For primary bibliographic entry see Field 10C. W79-00106

LOCAL DIFFERENCES IN THE PATTERNS OF VARIABILITY OF TROPICAL RAINFALL: SOME CHARACTERISTICS AND IMPLICA-

University of New England, Armidale (Australia). Dept. of Geography. I. J. Jackson. Journal of Hydrology, Vol. 38, No. 3/4, p 273-287, August 1978. 6 fig, 8 tab, 21 ref.

Descriptors: "Rainfall, "Tropical regions,
"Variability, Data processing, Correlation analysis, Analytical techniques, Networks, Rain gages,
Watersheds(Basins), Rain, Spatial distribution,
Daily hydrographs, Monthly, Annual, Weather,
Meteorology, Hydrology, Inter-station dif-

The paper illustrated that for time periods of a month or longer, variability patterns of tropical rainfall can differ considerably at nearby locations (i.e., less than 1 km to 20 km). This is so even when stations are in an area of uniform relief and their stations are in an area of uniform relief and their long-term averages are similar. At one station, rainfall in a particular month or season can be well above average but below average at a station a few km away. The degree of 'localness' of variability patterns is much greater in the tropics than in higher latitudes. This fact is particularly important when the small scale of peasant agriculture in the tropics is considered. It is also significant for rainfall measurement and analysis. (Sims-ISWS) W79-00113

RAINFALL FREQUENCIES FOR THE PERSIAN GULF COAST OF IRAN, Dames and Moore, Denver, CO. U. Kappus, J. M. Bleek, and S. H. Blair. Hydrologica Sciences Bulletin, Vol. 23, No. 1, p 119-129, March 1978. 2 fig, 4 tab, 19 ref.

Descriptors: *Rainfall, *Probable maximum precipitation, *Duration curves, *Foreign countries, Precipitation(Atmospheric), Frequency, Watersheds(Basins), Statistical methods, Analysis, Model studies, Foreign research, Depth, Analytical techniques, *Iran, *Persian Gulf(Iran), Rainfall depth-duration relationships.

This analysis was undertaken to develop appropriate extreme flood design criteria for a nuclear power plant at Halileh, near Bushehr, Iran, adjacent to the Persian Gulf. Graphical relationships presented provide a convenient means of estimating the probable maximum precipitation and the 2- to 100-year return period rainfall events with durations from 5 min to 24 h. The relationships may be amplied for drainage areas un to 25 so with durations from 5 min to 24 h. The relationships may be applied for drainage areas up to 25 sq km. Probable maximum precipitation and 2- to 100-year return period rainfall events were estimated. Precipitation depth-duration relationships were derived. The depth-duration-frequency relationships should not be applied to more mount

SELECTED WATER CYCLE ABSTRACTED AND STAW -- Ship

Group 2B—Precipitation

tainous areas inland from the Persian Gulf without adjustment for orographic effects. Data used for the estimation of probable maximum precipitation and rainfal depth-duration-frequency relation-ships, were: (1) precipitation-monthly, daily, and supp., were: (1) precipitation-monthly, daily, and hourly; (2) dewpoint temperature-maximum per-sistent 12 h values; (3) upper air data-wind and temperature; and (4) annual number of days hav-ing thunderstorms. (Humphreys-ISWS) W79-00123

AN ESTIMATE OF ANNUAL RUNOFF FROM ENGLAND AND WALES, 1728-1976, Department of the Environment, Reading (England). Water Data Unit. For primary bibliographic entry see Field 2E. W79-00124

SOLID STATE EVENT RECORDER FOR RAIN-FALL MEASUREMENT, Institute of Hydrology, Wallingford (England). M. Turner, and G. P. Brunsdon. Hydrological Sciences Bulletin, Vol. 23, No. 1, p 143-149, March 1978. 5 fig.

Descriptors:

"Precipitation(Atmospheric), "Rain gages,
"Instrumentation, Measurement, Precipitation
gages, Foreign research, Electronic equipment,
Equipment, "United Kingdom, Tipping bucket rain gage, Event recorder.

A solid state event recorder and a reader suitable for use with a tipping bucket raingage were described. The recorder is a small battery operated unit with very low power consumption, capable of recording 64, 8 bit, words. A portable reader unit was used to interrogate it. (Humphreys-ISWS) W79-00125

A STORM RAINFAL PATTERN ABOVE THE CENTRAL AFRICAN PLATEAU,
Corporation for Engineering, Geological and
Hydrological Investigation, Prague (Czechoslovakia). Stavebni Geologie. J. Balek. Hydrological Sciences Bulletin, Vol. 23, No. 1, p 151-156, March 1978. 2 fig, 4 tab, 7 ref.

Descriptors: *Rainfall disposition, *Africa, *Tropical regions, *Rainfall, Spatial distribution, Temporal distribution, Analysis, Depth-area-dura-tion analysis, Thunderstorms, Foreign research, *Central African Plateau.

The spatial and temporal distribution of tropical rainfall above a small tropical basin on the Central African Plateau was studied by using a dense net-work of rainfall recorders. Rainfall on the plateau is associated with thunderstorms, and most of the daily totals originate from rains of a short dura-tion. The resuls indicated a high variability of the rainfall pattern within a small area of less than 5 sq km. Formulas for the calculation of the rainfall rate and depth-area-duration relationship were presented for the purpose of network construction and engineering design in tropical Africa. and engineering (Humphreys-ISWS) W79-00126

ACID PRECIPITATION IN THE NETHER-Department of Environmenta Control, Haarlem

(Netherlands).
For primary bibliographic entry see Field 5A.

W79-00138 HAILSTONE SIZE INFERRED FROM DENTS

IN COLD-ROLLED ALUMINUM SHEET, Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab. For primary bibliographic entry see Field 7B. W79-00139

CLIMATOLOGY OF INSTANTANEOUS RAIN-

CLIMATOLOGY OF INSTANTANEOUS AGAIN FALL RATES, Illinois State Water Survey, Urbana. D. M. A. Jones, and A. L. Sims. Journal of Applied Meteorology, Vol. 17, No. 8, p 1135-1140, August 1978. 5 fig., 2 tab, 3 ref. AFCRL F19628-69-C-0070, F19628-72-C-0052.

*Rainfall. *Rainfall Descriptors: intensity, *Frequency curves, *Climatology, Rain, Rates, Precipitation(Atmospheric), Rain gages, Instru-mentation, Data processing, Precipitation intensity, Meteorology

Raingage records from four climatic zones (maritime subtropical, continental temperate, maritime temperate, and midlatitude interior) were analyzed to study instantaneous rainfall rates as defined by 1 and 4 min accumulations. The frequency distribution of rainfall rates was detered for stations in each of these climatic zones, mined for stations in each of these climatic zones, and a zonal average frequency distribution was calculated. A progression in the frequency of more intense precipitation was found from the North Pole to the Equator since all of the data were taken from the Northern Hemisphere. The most intense rainfalls were recorded at stations in the maritime subtropical zones and the least intense rainfalls in the maritime temperate zones. (Sims-ISWS)

RELATION BETWEEN THE ST. LOUIS URBAN PRECIPITATION ANOMALY AND SYNOPTIC WEATHER FACTORS, Illinois State Water Survey, Urbana.

J. L. Vogel, and F. A. Huff.

Journal of Applied Meteorology, Vol. 17, No. 8, p
1141-1152, August 1978. 9 fig, 3 tab, 13 ref.

Descriptors: "Rainfall, "Precipitation(Atmospheric), "Cities, Weather patterns, Spatial distribution, Effects, Weather patterns, Rainfall intensity, Synoptic analysis, Winds, Storms, Movement, Summer, Fronts(Atmospheric), Meteorology, "St. Louis(MO), Synoptic weather types, Precipitation anomalies, Project METROMEX.

The summer (June-August) rainfall distribution on the METROMEX network was analyzed to determine the synoptic conditions during which the urban-industrial regions of St. Louis affect the precipitation process. The rainfall patterns were stratified by direction of movement of convective entities in storm systems, surface wind direction, and basic synoptic weather types. The results pro-vided support for enhancement of rainfall downstorm from the urban-industrial region. Although only 23% of the 330 storms moved from the west-southwest, the storms produced 42% of the network rainfall and were strong contributors to the rainfall anomaly that maximizes 25-30 km northeast of St. Louis. Cold front conditions with the major convective entities moving from the southwest and squall lines with any storm motion were associated with the most intense rainstorms over the raingage network, and these storms were also largely responsible for the rainfall anomaly. The rainfall pattern based on air mass storms did not indicate any significant urban enhancement of rainfall and study of squall zone storms suggested possible reduction of rainfall in the urban region. W79-00328

ELECTRIC RAINFALL INTENSITY SENSOR, State Univ. of New York at Albany. Dept. of Atmospheric Science.

T. E. Battalino, and B. Vonnegut. Journal of Applied Meteorology, Vol. 17, No. 8, p 1225-1231, August 1978. 8 fig, 2 ref. ONR N00014-71-C-0156, N00014-75-C-0221.

Descriptors: "Rain gages, "Rainfall, "Rainfall in-tensity, Instrumentation, Equipment, Electrical equipment, Precipitation(Atmospheric), Precipita-

tion intensity, Snowfall, Automation, Measurement, Calibrations, Meteorology.

An instrument having a logarithmic response was described that continuously measures rates of rainfall over the range 0.3-350 mm/h by determining the electrical power required to evaporate the water as it arrives on an exposed sensor. Laboratory calibration experiments illustrated characteristics of the instrument, and field tests showed agreement with a standard tipping-bucket ra-ingage. (Sims-ISWS) W79-00329

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUNTAINOUS BASIN,

British Columbia Univ., Vancouver. Dept. of Geography.
For primary bibliographic entry see Field 5B. For primary W79-00332

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN, Canada Centre for Inland Waters, Burlington

(Ontario). For primary bibliographic entry see Field 5A. W79-00339

SIMULATION OF COLD CLOUD PRECIPITA-TION IN A THREE DIMENSIONAL MESOSCALE MODEL, National Oceanic and Atmospheric Administration, Boulder, CO. Atmospheric Physics and Chemistry Lab.

C. F. Chappell, and D. R. Smith.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 265, Price codes: A03 in paper copy, A01 in microfiche. Technical Report ERL 381-APCL40, October 1976. 30 p., 48 fig, 16 ref, 1 append. Bu. Rec. 14-06-

Descriptors: *Cloud physics, *Weather forecasting, *Weather modification, *Model studies, Mathematical models, Nucleation, Cloud seeding, Ice, Snow, Precipitation(Atmospheric), Clouds, Rainfall, Forecasting, Equations, Weather, Meteorology.

A cold cloud microphysical model was developed and merged with a 15-level primitive equation mesoscale dynamical model. The microphysical model partitions ice particles into three categories: unrimed, partially rimed, and graupel. Each is con-sidered to have a Marshall-Palmer distribution and is assigned its own set of physical characteristics. Criteria for converting from one ice particle category to another were based on a comparison of accretional to depositional growth rates. Six prognostic equations predict the concentration and mixing ratio for each ice particle category. Processes in the model include deposition, accretion, condensation, evaporation, sublimation, nucleation, and sedimentation. Microphysical processes were coupled back into the dynamical prediction equations so that the effect of ice processes on the air flow could be investigated. The mesoscale model was used to investigate numerically the development and distribution of snowfall over a mountain massif during a 4500second integration. It appears to simulate realistically the nucleation and growth of ice particles and their transport and sedimentation to the mountain surface. Snowfall distribution, including the leeward extent of precipitation, also appears reasonable and consistent with that observed along the continental divide of Colorado for similar wind regimes. (Sims-ISWS) W79-00468

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Streamflow and Runoff-Group 2E

RELATIONSHIP OF RAINFALL AND LAKE GROUNDWATER SEEPAGE, McGill Univ., Montreal (Quebec). Dept. of Biolo-

gy. For primary bibliographic entry see Field 5B. W79-00489

POTENTIAL AND LIMITATIONS OF RAIN-FALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS, Papua New Guinea Univ., Port Moresby (New Guinea). Dept. of Geography. For primary bibliographic entry see Field 2A. W79-00491

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN, Washington Univ., Seattle. Dept. of Civil Engineers. For primary bibliographic entry see Field 2E. W79-00492

2C. Snow, Ice, and Frost

ICEBREAKING CAPABILITY OF CCGS
'LABRADOR' IN WESTERN BARROW STRAIT,
OCTOBER 23-28, 1973,
Department of the Environment, Ottawa
(Ontario). Marine Sciences Directorate.
J. D. Bradford.

Manuscript Report Series No. 50, 1978, 13 p, 3 fig, 4 tab, 16 ref.

Descriptors: "Sea ice, "Icebreakers, "Ice cover, "Barrow Strait, Navigation, "Ice loads, McDou-gall Sound, "Labrador", Arctic ice, Ice breakup, Ships.

In October 1973, the Canadian government icebreaker CCGS 'Labrador' carried out performance trials in the western Barrow Strait. Progress of the vessel was monitored as it passed through light ice conditions for approximately 320 through light ice conditions for approximately 320 miles in the Barrow Strait-McDougall Sound area. Ice thickness and pressure were observed whenever possible. Most of the time, the 'Labrador' operated in continuous mode without having to stop, back up, and charge through blocking ice. However, enough resistance was encountered to suggest that in normal years, vessels with the icebreaking capacity of the 'Labrador' would be unable to operate in the Barrow Strait beyond mid-November. Ice conditions from 1962-1973 and ice thickness measurements from 1956 to 1973 are summarized. Also, capacities of several icebreaking vessels in various ice conditions are compared. (Majtenyi-IPA)

FRAZIL ICE FORMATION: A REVIEW. Alaska Univ., College. Geophysical Inst.

Alaska Univ., College. Geophysical Inis.
T. E. Osterkamp.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol. 104, No. HY9,
Proceedings Paper 14023, p 1239-1255, September
1978. 3 fig. 1 tab, 63 ref, 1 append.

Descriptors: *Frazil ice, *Rivers, *Ice, *Reviews, Crystal growth, Nucleation, Open channels, Turbulent flow, Supercooling, Heat transfer, Theoretical analysis, Water temperature, Crystals, Freezing, Mathematical models, Physical properties, Equations, Crystal growth, Ice jams, On-site investigations, Ice formation.

The problems associated with frazil ice formation The problems associated with frazil ice formation were examined; the current state-of-the-art was reviewed; and recommendations for future research were made. No priorities were assigned to these recommendations. Future research should focus on obtaining heat transfer data, temperature

measurements, flow measurements, physical measurements on frazil ice crystals (particularly frazil ice concentration), frazil ice nucleation processes, evolution of frazil ice crystals, anchor ice formation, forecasting the occurrence of frazil ice, entrainment of frazil ice crystals in the flow and the transment of trazil ice crystals in the flow and the resulting two-phase flow, adherence of frazil ice crystals to each other and to objects in the flow, granular growth in pans, flow producing mechanisms in rivers, and the initiation and development of river ice covers from frazil ice. The greatest need is for field measurements and field investigations of the preceding problems dur-ing periods of frazil ice formation in rivers. (Humphreys-ISWS) W79-00120

INLAND ICE SHEET THINNING DUE TO HOLOCENE WARMTH,
Ohio State Univ., Columbus. Dept. of Geology and Mineralogy; and Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.

Foundation, Commission and Commissio

Descriptors: *Ice, *Ice cover, *Recent epoch, *Antarctica, Model studies, Mathematical models, Climatology, Glaciers, Glaciology, Ice sheets, Ice sheet thinning, Warming.

The climatic warming of 10,000 years ago is now affecting the central portions of ice sheets, causing ice-flow acceleration. This process explains the present-day thinning of the ice sheet in West Antarctica. Former ice sheets also must have responded to climatic warming with a delay of responded to chimate warming with a decay of thousands of years. This lag in response is impor-tant in the climatic interpretation of glacial deposits and of changes in ice volume obtained from deep-sea cores. (Sims-ISWS) W79-00340

ALLOWING FOR THE WATER PERMEABILITY OF FROZEN GROUND SCREENS DURING THEIR FORMATION,
For primary bibliographic entry see Field 8D.
W79-00467

MIXING IN AN ARCTIC FJORD, Institute of Ocean Sciences, Sidney (British Columbia). Frozen Sea Research Group.
For primary bibliographic entry see Field 2L. W79-00487

2D. Evaporation and Transpiration

DETERMINATION OF TERRESTRIAL ALBEDO FROM LANDSAT I SATELLITE IMAGERY IN PHOTOGRAPHIC FORM, Arizona Water Resources Research Center, Tuc-For primary bibliographic entry see Field 7B. W79-00012

A NOVEL METHOD OF ESTIMATING THE DISCHARGE OF WATER FROM MOUND SPRINGS OF THE GREAT ARTESIAN BASIN, CENTRAL AUSTRALIA, South Australia Dept. of Mines, Adelaide

For primary bibliographic entry see Field 2F. W79-00112

CHEMICAL INHIBITORS OF PLANT TRANS-PIRATION: IV. ACTION OF ALAR-85, (IN FRENCH), Institut Pasteur, Paris (France).

Bull Soc Bot Fr 123(3/4), p 107-111, 1976.

*Chemical Descriptors: inhibitors(Plants), Plant transpiration, *Alar-85, *Daminozide, Acids, Vicia-Faba.

B-995 or N-dimethylaminosuccinamic acid, is a B-993 of N-dimethylaminosuccinamic acid, is a white powdered substance known as Ala-85 or Daminozide. The transpiration of the leaves of the broad bean (Vicia faba) was significantly decreased if they were treated with a 2% solution of Ala-85 for 4 days. The action was more important at the upper surface of the leaflets than at the lower surface.--Copyright 1978, Biological Ab-

A SIMPLE MODEL FOR SHALLOW LAKE EVAPORATION,
Royal Netherlands Meteorological Inst., De Bilt (Netherlands)

Journal of Applied Meterology, Vol. 17, No. 8, p 1132-1134, August 1978. 3 fig, 11 ref.

Descriptors: *Evaporation, *Lakes, *Model studies, Energy budget, Latent heat, Foreign coundies, Energy outget, Latent near, Foreign countries, Foreign research, Vapor pressure, Meteorological data, Water, Moisture defecit, Equations, "Lake evaporation, "Shallow lake evaporation, "The Netherlands, Empirical model, Penman equation, Saturated surfaces, Saturation vapor pressure.

The empirical model of Priestley and Taylor and the well-known Penman equation were combined to obtain a simple expression for evaporation from a shallow lake. The model was tested for a large lake in The Netherlands with an area of about 460 sq km and an average depth of 3 m. The estimated values of evaporation of 1, 5, 10, and 20 days were compared with energy-budget measurements. The comparison indicated that the proposed model gave good results for periods of 10 days or more. (Roberts-ISWS) W79-00326

2E. Streamflow and Runoff

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, I. TRACER STUDIES, New South Wales, Kensington (Australia). School of Civil Engineering. D. H. Pilgrim, and D. D. Huff. Journal of Hydrology, Vol. 38, No. 3/4, p 299-318, August 1978. 6 fig, 1 tab, 28 ref.

Descriptors: *Runoff, *Surface runoff, *Subsurface runoff, *Tracers, Radioisotopes, Bromine, Chromium, On-site investigations, Isotope studies, Soil water movement, Spatial dis-tribution, Temporal distribution, Storm runoff, Rainfall, Drainage, Infiltration, Hydrology, Soil

Recent studies have demonstrated the occurrence of a variety of storm runoff processes, including those associated with variable source areas. However, there is a need for experimental methods for studying the spatial variability of these processes in the field. One promising method is the use of in the field. One promising method is the use of tracers. When two radiotracers, 51Cr and 82Br, were used in a pilot study of surface and subsur-face storm runoff, irregular spatial flow patterns were observed. These patterns were related primarily to the thickness of the surface soil horizon and showed the value of tracers for quantifying horizontal and vertical profiles of flow pathways. Several improvements are possible in measurement techniques and should provide a means for obtaining detailed spatial definition of surface and subsurface storm flow pathways in the field. (See also W79-00116) (Sims-ISWS) W79-00115

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Field 2-WATER CYCLE

Group 2E—Streamflow and Runoff

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, II. RUNOFF PROCESSES, New South Wales Univ., Kensington (Australia).

New South Wates Univ., Kensington (Austrana). School of Civil Engineering. D. H. Pilgrim, D. D. Huff, and T. D. Steele. Journal of Hydrology, Vol. 38, No. 3/4, p 319-341, August 1978. 6 fig., 41 ref.

Descriptors: *Runoff, *Surface runoff, *Subsurface runoff, *On-site investigations, Storm runoff, Rainfall, Soil water, Soil water movement, Sediments, Dissolved solids, Suspended solids, Flow, Hydrographs, Infiltra-tion, Electrical conductance, Water chemistry, Tracers, Isotope studies, Hydrology, Runoff

Combined use of radioisotope tracer, flow rate, specific conductance, and suspended-sediment measurements on a large field plot near Stanford, California, has provided more detailed information on surface and subsurface storm runoff processes than woul be possible from any single approach used in isolation. Although the plot was aurficially uniform, the runoff processes were shown to be grossly nonuniform, both spatially over the plot, and laterally and vertically within the soil. The three types of processes that have been suggested as sources of storm runoff (Horton-type surface runoff, saturated overland flow, and rapid subsurface throughflow) all occurred on the plot. The nonuniformity of the processes supports the partial- and variable-source area concepts. Subsurface storm runoff occurred in a saturated layer above the subsoil horizon, and short travel times resulted from flow through macropores rather than the soil matrix. Considera-tion of these observations would be necessary for physically realistic modeling of the storm runoff process. (See also W79-00115) (Sims-ISWS) W79-00116

STREAM TEMPERATURE ESTIMATION USING KALMAN FILTER,

Pittsburgh Univ., PA. Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. W79-00121

AN ESTIMATE OF ANNUAL RUNOFF FROM ENGLAND AND WALES, 1728-1976,

Department of the Environment, Reading gland). Water Data Unit. T. J. Marsh, and I. G. Littlewood.

Hydrological Sciences Bulletin, Vol. 23, No. 1, p 131-142, March 1978. 6 fig, 2 tab, 9 ref.

Descriptors: *Runoff, *Discharge(Water),
*Annual, Foreign countries, Watersheds(Basins), Descriptors: Model studies, Analysis, Methodology, Statistical methods, Foreign research, *England, *Wales.

One consequence of the 1975-1976 drought was a growing concern about the distribution with respect to time of the available water resources in England and Wales. Various indices of drought have been derived based largely on records of rainfall, but in some cases on studies of the discharge for certain rivers. This paper presented estimates of annual runoff from England and Wales as a whole, from 1728 to 1976. Simple probability analysis showed that annual runoff from England and Wales of the order of 300 mm can be expected, on average, once every 20 years and runoff of 200 mm, on average, once every 125-200 years. Temporal vairations of water-year runoff from England and Wales must still be considered random due to the lack of statistical evidence to suggest otherwise. (Humphreys-ISMEO) W79-00124

CHARACTERISTICS OKLAHOMA STREAMS, Geological Survey, Oklahoma City, OK. Water Resources Div.

Open-file report 78-166, March 1978. 93 p, 5 fig, 3 tab, 5 ref.

Descriptors: *Low flow, *Streamflow, *Flow rates, *Oklahoma, Hydrologic data, Base flow, Flow characteristics, Measurement, Sites.

Analysis of streamflow records in Oklahoma show Analysis of streamflow records in Oklahoma show the 2-, 10-, and 20-year low-flow frequency for 1-, 7-, 14-, and 30-day durations for 143 continuous record stations, 46 partial record, and 56 miscellaneous sites. Low-flows of small uncontrolled streams are zero for the State except for northeastern and south-central Oklahoma.

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE OLYMPIC PENINSULA, WASHINGTON.

Geological Survey, Tacoma, WA. Resources Div. W. L. Haushild, and D. E. LaFrance.

Open-file report 77-812, 1978. 25 p, 5 fig, 1 plate, 3 tab. 8 ref.

Descriptors: *Low flow, *Streamflow, Base flow, *Streamflow forecasting, *Flow duration, Low flow frequency, Flow rates, Runoff *Washington, *Olympic Peninsula(Wash).

Streams in lowland basins of the Olympic Peninsu-la, Washington, generally have their low flows in summer and peak flows in winter, whereas streams originating at higher elevations in the mountains have their low flows in late summer-early fall and they have both winter and spring peak flows. Data from long-term stations indicate no important trend in low flows during 1940-73 but no important trend in low flows during 1940-75 but they do indicate that low flows generally were lower during the relatively dry 1940's than during the relatively wet 1950-73 period. The magnitude and frequency of 7-day low flows were estimated for 116 sites either from frequency analyses of a data at long-term stations or from correlation of data at a short-term station with data at an appropriate long-term station. (Woodard-USGS) W79-00258

ANALYSIS OF FLOOD RESULTING FROM THE TOCCOA FALLS, GEORGIA, DAM BREAK,

Geological Survey, Bay St. Louis, MS. Water Resources Div.

L. F. Land. Conference Floods on Flash in: Conterence on Flash Floods; Hydrometeorological Aspects, May 2-5, 1978, Los Angeles, California: Published by the American Meteorological Society, Boston, Mass., p 127-130, 1978. 2 fig. 1 tab., 4 ref.

Descriptors: *Floods, *Dam failure, *Flood data, *Flood discharge, *Peak discharge, Flood frequency, Rainfall, Storm runoff, Georgia, *Toccoa Falls Dam, Comparison analysis, Natural

Hydrologic data are presented for the flood resulting from the Toccoa Falls, Georgia, dam break on November 6, 1977. Magnitudes of the dam-break flood are compared with the magnitudes of the flood that would have been expected from the rainfall had the dam break not occurre. Comparisons are also made with 10- and 100-year flood estimates. The magnitude of the peak discharge directly below the dam break was about 25 times the natural 10-year flood. By the time the flood wave reched a point 7.75 miles downstream, the peak discharge was attenuated so the magnitude was in the range of the 10- to 100-year natural W79-00262

MODEL OF THE FLOODING CAUSED BY THE FAILURE OF THE LAUREL RUN RESERVOIR

DAM, JULY 19-20, 1977, NEAR JOHNSTOWN, PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Geological Surv Resources Div. J. T. Armbruster. Water

RELATIONSHIP OF RAINFALL

In: Conference on Flash Floods; Hydrometeorological Aspects, May 2-5, 1978, Los Angeles, California: Published by the American Meteorological Society, Boston, Mass., p 190-193,

Descriptors: *Model studies, *Dam failure, *Floodwater, *Mathematical models, *Flash floods, Synthetic hydrology, Pennsylvania, *Johnstown area, *Laurel Run Reservoir Dam.

On july 19 and 20, 1977, a severe rainstorm caused On july 19 and 20, 1977, a severe rainstorm caused heavy flooding to many areas near Johnstown, Pennsylvania. This paper is concerned only with the flooding in the Laurel Run basin; much of the the flooding in the Laurel Run basin; much of the flood was caused by the failure of Laurel Run Reservoir Dam. A mathematical model of a breach-induced flood wave was applied to the Laurel Run dam failure. The model estimates wave velocity and height, peak discharges, and other flood-wave characteristics for the reach from the dam to the mouth of Laurel Run, about 75 miles. Water surface alevations simulated by 2.5 miles. Water-surface elevations simulated by the model are in close agreement with high-water profile data collected in the field. W79-00263

HIGH-FLOW FREQUENCIES FOR SELECTED STREAMS IN OKLAHOMA, Geological Survey, Oklahoma City, OK Water

Resources Div.

T. L. Huntzinger.
Open-file report 78-161, April 1978. 30 p, 1 fig, 3 tab, 3 ref.

Descriptors: "High flow, "Streamflow, "Oklahoma, "Frequency analysis, "Storm runoff, Floods, Peak discharge, Gaging stations, Flow rates, Flow characteristics, Hydrologic data,

Streamflow records are analyzed statistically to determine high-flow characteristics of selected streams in Oklahoma. Tables show the 2-, 5-, 10-, streams in Okianoma. I ables show the 2-, 5-, 10-, 25-, 50-, and 100-year high-flow frequencies for durations of 1, 3, 7, 30, 90, and 365 days. The log-Pearson Type III frequency distribution was used in the computations. Streamflow records used include data extending from 1903 to 1974. (Woodard-1960) USGS) W79-00273

LONGITUDINAL DISPERSION OF FLUID PAR TICLES IN MOUNTAIN STREAMS: I. THEORY AND FIELD EVIDENCE,

Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 5B. W79-00308

LONGITUDINAL DISPERSION OF FLUID PAR-TICLES IN MOUNTAIN STREAMS: 2.
SIMILARITY OF THE MEAN MOTION AND OF THE MEAN MOTION A! ITS APPLICATION, Geological Survey of Canada, Ottawa (Ontario). For primary bibliographic entry see Field 5B. W79-00309

THREE-DIMENSIONAL OPEN CHANNEL

Pittsburg Univ., PA. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W79-00312

FLOOD REGIONS IN JAMAICA Calgary Univ., Alberta. Dept. of Geography. L. C. Nkemdirim, and E. B. Jones. Hydrological Sciences Bulletin, Vol. 23, No. 1, p 63-83, March 1978. 19 fig, 6 tab, 7 ref. Descrip flood, S area, D tries, I gions, S Stream

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aphy. 3, No. 1, p Descriptors: *Floods, *Flood plains, *Regional flood, Streamflow, Rainfall, Drainage, Drainage area, Drainage density, Hydrology, Foreign counties, Islands, Watersheds(Basins), *Flood regions, *Jamaica, *West Indies, Stream frequency,

This paper showed that flood potential regions in Jamaica can be derived from data on streamflow, minfall, and drainage basin characteristics. The probability curves for each region may be used to estimate flood frequency in uncalibrated basins in the region or in sections of streams that are hitherthe region of in sections of streams that are nither-to ungaged. The relationship between the annual average on-day flood flow and the instantaneous annual maximum flood is good enough to enable estimates of the latter to be made when only the former is known. (Lee-ISWS) W79-00330

SIMULATION OF FLOWS IN UNGAGED Severn-Trent Water Authority, Birmingham R. E. Manley. Hydrological Sciences Bulletin, Vol. 23, No. 1, p 85-101, March 1978. 5 fig, 6 tab, 11 ref.

Descriptors: *Simulation analysis, *Basins, *Model studies, Streamflow, Hydrology, Mathematical models, Flow, Computer models, Computers, *Ungaged basins, Streamflow simulation, Model calibration.

There are two ways in which a hydrological simulation model can be used to estimate flows in an ungaged basin. The first method, and the only one generally used so far, is to calibrate the model to a similar basin and use the parameter values thus obtained. The second is to use parameters based on measured basin characteristics. Described herein was a model for which most of the parameters are of the second type. This model was applied using mesured basin characteristics to obtain the mesured basin characteristics to obtain the parameter values and without reference to the gaged flows. The accuracy of the model was good, the correlation coefficient for daily flows being 0.86 and for monthly fows being 0.97. The model was then calibrated to the basin using a version of the Rosenbrock method. Comparison of measured and calibrated parameter values demonstrated the viability of this approach. (Lee-ISWS) W79-00331

MOMENTUM TRANSFER IN A COMPOUND CHANNEL, Ulster Coll. Northern Ireland Polytechnic, Jordan-

For primary bibliographic entry see Field 8B. W79-00334

GENERAL TWO DIMENSIONAL RIVER

SIMULATOR, Waterloo Univ. (Ontario). Dept. of Systems

M. Chandrashekar, L. R. Muir, and T. E. Unnv. M. Chandrashekar, L. R. Murr, and T. E. Unny. In: Proceedings of the International Symposium, University of Manitoba, Winnipeg, Canada, Au-gust, 1976, entitled 'Large Engineering Systems'. Alvin Wexler (Ed.), Pergamon Press, Inc., Ox-ford, United Kingdom, p 473-482, 1977. 5 fig, 2

Descriptors: *River systems, *Simulation analysis, *Unsteady flow, Estuaries, Computer programs, Algorithms, *Hydrology, Equations, Mathematical models, Systems analysis, Sparse matrix techniques, Finite-difference model.

In recent years, considerable attention has been focussed on the use of implicit finite-difference schemes for solving unsteady flow problems in rivers and estuaries. The major advantage of the implicit method is its unconditional stability for any time or distance steps. The main obstacle in

using the method has been the necessity to solve a large system of linearized equations. The algorithm presented herein deals with a two dimensional implicit finite-difference model suitable for the solution of the Navier-Stokes equations; the system of linear equations is solved using sparse matrix techniques. The model has been implemented into a computer program which accepts arbitrary river configurations and different boundary conditions. The model has been applied to a portion of the St. Clair River (which borders the state of Michigan and the province of Ontario). Also, numerical experiments have been carried out on a hypothetical river system. Results are presented. It is concluded that the model has clearly shown the validity and applicability of a two dimensional implicit finite difference scheme for the solution of general river systems. Further work is to be done regarding the effect of changing Manning's n as a function of river bed shape, inclusion of double boundary conditions, and special boundary conditions at the 270 degree corners. (Bell-Cornell)

RIVER TEMPERATURE VARIATION WITH

RIVER TEMPERATURE VARIATION WITH FREEZING AND STORAGE,
Minnesota Univ, Minneapolis. Dept. of Civil and Mineral Engineering; and Minnesota Univ., Minneapolis. St. Anthony Falls Hydraulic Lab. C. C. S. Song, and K. S. Leung.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Proceedings Paper 14054, Vol. 104, No. EE5, p. 879-888, October 1978. 6 fig, 4 ref, 1 append. NSF ENG74-02036.

Descriptors: *Water temperature, *United States, Rivers, "Model studies, Mathematical models, Stochastic processes, Air temperature, Freezing, Storage, Correlation analysis, Probability, Regression analysis, Water storage, Temperature, Streams, Ice, Thermal properties, Thermal water, Versichility

Water temperature in the northern part of the US is significantly affected by the freezing phenomenon. Because of the freezing constraint on the variability of water temperature, there is a good correlation between the mean value and the fluctuating component. The probability density curve of water temperature variation develops a curve of water temperature variation develops a sharp peak near the freezing point. A stochastic model using two independent variables, air tem-perature variation, and the mean daily water tem-perature, was developed. It also was shown that the water temperature variability tends to decrease as a dimensionless reservoir storage capacity decreases. (Sims-ISWS) W79-00477

SIMPLE SAMPLER ACTIVATION AND RECORDING SYSTEM, North Carolina State Univ. at Raleigh. Dept. of

Biological and Agricultural Engineering. For primary bibliographic entry see Field 7B. W79-00480

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN, Washington Univ., Seattle. Dept. of Civil En-

gineers.
D. P. Lettenmaier, and S. J. Burges.
Water Resources Research, Vol. 14, No. 4, p 679-687, August 1978. 17 fig, 1 tab, 25 ref. NSF DEB74-20744-A02.

Descriptors: *Streamflow, *Reservoirs, *Model studies, *Mathematical models, Markoov processes, Monte Carlo method, Flow, Climates, Precipitation(Atmospheric), Runoff, Storage, Time series analysis, Climatology, Hydrology.

Controversy regarding origins of the so-called Hurst phenomenon has continued since the first

appearance of Hurst's work. There appear to be at least two general mechanisms which might generate geophysical time series displaying the Hurst phenomenon. The first is nonstationarity of process mean level perhaps owing to dynamic characteristics of the entire earth geophysical system. The second generating mechanism is a sta-tionary model structure such as the Box-Jenkins tionary models with parameters such that substantial low-frequency effects are present. A series of Monte Carlo tests were formed which showed that it will generally be very difficult to distinguish between the two generating mechanisms on the basis of geophysical records of lengths usually available. The Monte Carlo experiments were augmented by The Monte Carlo experiments were augmented by analysis of several series of tree ring growth indices ranging in length from 506 to 1,164 years. Analysis of these sequences for nonstationarity in mean level showed that the sequences were entirely compatible with stationary Box-Jenkins models earlier fit to the data by Hipel. However, a similar analysis of the variance of the time series showed that there was evidence nonstationarity in the variance. that there was evidence nonstationarity in the variances of the records such that the time series were ances of the records such that the time series were not compatible with the constant variance assumption of the stationary Box-Jenkins models. Finally, sevral reservoir simulations were made by using the sequent peak algorithm for type A (nonstationary mean) and type B (constant mean) models which had been found to be statistically indistinguishable in the Monte Carlo experimen The results showed that so long as nonstationarity in mean level was modest and demand levels were not too high, the models give very similar results; however, at high demand levels or large non-sta-tionarity in process mean, substantial differences in storage requirements may result. (Sims-ISWS) W79-00492

2F. Groundwater

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT, Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.
For primary bibliographic entry see Field 5A.
W79-00003

ELECTRICAL-RESISTIVITY SURVEYS FOR GROUNDWATER IN THE DECCAN TRAP COUNTRY OF SANGLI DISTRICT, MAHARASHTRA, Geological Survey of India, Hyderabad. For primary bibliographic entry see Field 4B.

ON THE TWO-DIMENSIONAL GROUND-WATER MOVEMENT,
Thessaloniki Univ., Salonika (Greece). Faculty of

Technology.
D. K. Tolikas, A. S. Zorba, and P. D.

Latinopoulos. Journal of Hydrology, Vol. 38, No. 3/4, p 223-230, August 1978. 6 fig., 2 ref.

Descriptors: *Groundwater movement, *Model studies, *Mathematical models, Aquifers, Analytical techniques, Equations, Numerical analysis, Groundwater, Wells, Water wells, Hydrology, Boussinesq equation, Flow fields.

A simple technique to solve the linearized twodimensional Boussinesq equation in a nonsteady flow field with arbitrary shape was presented. According to this technique, the reservoir boundaries are replaced by small sources emitting attentuating waves. The characteristic content of each source depends on the shape of the flow field. The variation of the free surface at any point of the flow field results from the interaction of all the waves arriving at that point. This technique was applied to a flow field which is confined by rectilinear and

Field 2-WATER CYCLE

Group 2F-Groundwater

curvilinear boundaries. The results indicated satisfactory proximity to those obtained by numerical analysis. (Sims-ISWS) w79-00108

POLLUTION OF GROUNDWATER THROUGH NONLINEAR DIFFUSION, Punjab Agricultural Univ., Ludhiana (India). Dept.

of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00110

DIGITAL MODEL STUDIES OF UNSTEADY-STATE RADIAL FLOW TO PARTIALLY PENETRATING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS, Indian Inst. of Tech. Kanpur. Dept. of Civil En-

gincering.
V. Lakshminarayana, and S. P. Rajagopalan.
Journal of Hydrology, Vol. 38, No. 3/4, p 249-262,
August 1978. 6 fig, 26 ref.

Descriptors: "Groundwater, "Aquifers, "Wells, "Model studies, Mathematical models, Permeabili-ty, Specific yield, Drawdown, Storage, Storage capacity, Groundwater movement, Anisotropy, On-site investigations, Test wells, Pumping, Water wells, Hydrology.

A digital model solution was sought for the un-steady-state radial flow to a partially penetrating well pumping at a constant rate from an unconfined anisotropic aquifer. The solution technique used was the iterative alternating-direction implicit method. Attention was focused on the utility of the digital model to analyze aquifer test data in uncon-fined aquifers so as to evaluate the lateral permeafined aquifers so as to evaluate the tateral permea-bility, vertical permeability, specific storage, and specific yield of the aquifer. That an approximate steady-state solution of flow to partially penetrat-ing wells in unconfined aquifers can be sought also was illustrated. The digital model was applied to was mustrated. The digital model was appued to analyze field aquifer test data of the time distribu-tion of average drawdown at well screen depths, and of water table drawdown at two radial distances from the test well. (Sims-ISWS) W79-00111

A NOVEL METHOD OF ESTIMATING THE DISCHARGE OF WATER FROM MOUND SPRINGS OF THE GREAT ARTESIAN BASIN, CENTRAL AUSTRALIA,

South Australia Dept. of Mines, Adelaide. A. F. Williams, and J. W. Holmes. Journal of Hydrology, Vol. 38, No. 3/4, p 263-272, August 1978. 5 fig, 7 ref.

Descriptors: *Springs, *Australia, *Discharge(Water), *Measurement, Aerial photographs, Artesian aquifers, Flow, Seepage, Swamps, Streams, Vegetation, Evaporation, Aquifers, Fractures(Geologic), Hydrogeology, *Mound springs.

The discharge of mound springs of northern South Australia was measured by conventional stream-gauging methods during 1974. However, many springs are difficult of access or do not provide well-defined stream courses. Correlation of the measured springs with the area of swamp vegetation which they support showed that the spring water is dissipated by a mean evaporative flux of 6.5 mm/day + or -0.7. Such a measure could be apnm/way + or -0.7. Such a measure could be ap-plied to estimate spring discharges wherever aerial photographs suitable for a reliable delineation of the evaporating area of the associated swamps are available. (Sims-ISWS) W79-00112

USE OF DUMMY VARIABLES IN WATER RESOURCES STUDIES.

Florida Univ., Belle Glade. Inst. for Food and Agricultural Sciences.

For primary bibliographic entry see Field 2G. W79-00114

KRIGING IN THE HYDROSCIENCES,

Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological In-I. P. Delhomme

Advances in Water Resources, Vol. 1, No. 5, p 251-266, September 1978, 17 fig, 2 tab, 22 ref.

Descriptors: "Aquifers, "Groundwater, "Model studies, "Mathematical models, Transmissivity, Wells, Water wells, Observation wells, Networks, Network design, Equations, Analytical techniques, Mathematics, Hydrology.

Most of the methods currently used in hydrosciences for interpolation and spatial averaging fail to quantify the accuracy of the estimates. The theory of regionalized variables enables one to point out the relationship between the spatial correlation of hydrometeorological orbids and the precision of interpolation, or determination of average values, over these fields above extensive seated salls between polation, or determination of average values, over these fields. A new estimation method called krig-ing has proven to be quite well adapted to solving water resources problems. Presented herein was a series of case studied in automatic contouring, data input for numerical models, estimation of average precipitation over a given catchment area, and measurement network design. (Sims-ISWS) W79-00134

NEW FINITE ELEMENT TECHNIQUE FOR

A NEW FINITE ELEMENT TECHNIQUE FOR THE SOLUTION OF TWO-PHASE FLOW THROUGH POROUS MEDIA, Princeton Univ., NJ. Dept. of Civil Engineering. P. S. Huyakorn, and G. F. Pinder. Advances in Water Resources, Vol. 1, No. 5, p. 285-298, September 1978. 18 fig, 18 ref, 1 append. NSF AER74-01765.

Descriptors: "Groundwater movement, "Porous media, "Model studies, "Finite element analysis, Mathematical models, Analytical techniques, Flow, Groundwater, Numerical analysis, Equations, Hydrology, Weighting functions.

A new upstream weighting finite element technique was developed for improved solution of the two-phase immiscible flow equations. Unlike the upstream weighting technique used by previous investigators, the new technique does not employ finite difference conservations. ploy finite difference concepts to achieve the required upstream weighting of relative permea-bilities or mobilities. Instead, upstream weighting is achieved by (1) representing the relative permeabilities or mobilities as continuous functions expressed in terms of the shape functions and nodal values, and (2) using asymmetric weighting functions to weight the spatial terms in weighting functions to weight the spatial terms in the flow equations. These weighting functions are constructed such that they are dependent on the flow direction along each side of an element. In conjunction with the proposed technique, two solution schemes for treating the resulting set of non-linear algebraic equations were presented. These are the fully-implicit chord slope incremental solution scheme and the Newton-Raphson solution scheme and the Newton-Raphson solution scheme and the Newton-Raphson solutions where the scheme are the scheme and the scheme and the scheme and the Newton-Raphson solutions where the scheme are the scheme and the Newton-Raphson solutions where the scheme are the scheme and the Newton-Raphson solutions where the scheme are the scheme and the scheme are the scheme and the scheme are the scheme and the scheme are the scheme are the scheme and the scheme are the scheme and the scheme are the scheme and the scheme are tal solution scheme and the Newton-Raphson solu-tion scheme. Both schemes allow the use of large time steps without being unstable. The proposed numerical technique was applied to two problems: (1) the one-dimensional Budkley-Leverett problem, and (2) the two-dimensional five-spot well flow problem. Results indicated that this technique is superior to not only earlier finite ele-ment schemes but also to five acciet unsteam ment schemes but also to five-point upstream finite difference formulas. (Sims-ISWS) W79-00135

TYPE-CURVE ANALYSIS OF TIME-DRAW-DOWN DATA FOR PARTIALLY PENETRAT-ING WELLS IN UNCONFINED ANISOTROPIC

Indian Inst. of Tech. Kanpur. Dept. of Civil En-

gineering.
V. Lakshminarayana, and S. P. Rajagopalan.
Ground Water, Vol. 16, No. 5, p 328-333, September-October 1978. 5 fig, 16 ref.

Descriptors: "Curves, "Graphical analysis, "Aquifers, "Water wells, "Drawdown, Analytical techniques, Computer models, Water table aquifers, Anisotropy, Penetration, Permeability, Depth, Specific yelld, Storage coefficient, Model studies, "Partial penetration, "Type curves, Time-

With the aid of a computer, and using an iterative alternating-direction implicit method, a numerical solution was sought for the unsteady-state radial flow to partially penetrating wells pumping at a constant rate from an unconfined anisotropic aquifer. These solutions were used to generate a series of theoretical type curves valid for in-dividual aquifer test situations characterized by dividual aquifer test situations characterized by particular combinations of two constants C sub 1 = (P sub r/P sub z/m/r sub w/m/r sub w) and C sub 2 = (S sub y/S sub s(m)) and particular well penetration. The aquifer test data requirements are the time-drawdown data and at least two pairs of observation wells, one of the pair tapping well-screen depths and the other tapping water table depths. The parameters that were identified are the lateral permeability, vertical permeability, specific storage, and specific yield of the aquifer. The use of the type curves was illustrated by an example. (Visocky-ISWS)

SHORTEST PATH PROBLEMS IN HYDROGEOLOGY, Food and Agricultural Organization of the United Nations, Rome (Italy). Land and Water Develop-

For primary bibliographic entry see Field 6A. W79-00137

IAPS SHOWING WATER-LEVEL DECLINES LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA, Geological Survey, Tucson, AZ. Water Resources Div.; and Bureau of Reclamation, Phoenix, AZ. Arizona Dept. of Transportation, Phoenix. For primary bibliographic entry see Field 7C. W79-00251

GROUND-WATER DATA, 1974-76, INDIAN WELLS VALLEY, KERN, INYO, AND SAN BERNARDINO COUNTIES, CALIFORNIA, Geological Survey, Menio Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C. W79-00253

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILU-RIAN DOLOMITE. Survey, Madison, WI. Water

Resources Div. For primary bibliographic entry see Field 5B. W79-00256

GROUND-WATER LEVELS IN WYOMING. For primary bibliographic entry see Field 7C. W79-00259

GROUND-WATER AVAILABILITY IN THE HITCHCOCK-RED WILLOW, FRENCHMAN VALLEY, AND MEEKER-DRIFTWOOD IRRIGATION DISTRICTS, SOUTHWEST DISTRICTS,

Geological Survey, Lincoln, NE. Water Resources Div.

For primary bibliographic entry see Field 4B. W79-00260

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF

CUSTER Geologica Div. For prima W79-0027

POTENT FLORIDA RIVER AND VIC eologica Div. For prima W79-0027

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ISWS) W79-0031

THE IS THE SPRINGS TRALIA, Australia Heights. G. E. Cali Journal of August 19

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Geological Survey, Denver, CO. Water Resources

For primary bibliographic entry see Field 4B. W79-00274

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POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT AND VICINITY, FLORIDA, SEPTEMBER, 1977, Geological Survey, Orlando, FL. Water Resources Div.

For primary bibliographic entry see Field 7C. W79-00275

A DIGITAL MODEL OF PART OF THE RIO TEMPISQUE ALLUVIAL AQUIFER, COSTA

RICA, Servicio Nacional de Aguas Subterraneous, San Jose (Costa Rica). D. Mora-Castro, and J. W. Lloyd. Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 73-86, 1977. 8 fig, 2 tab, 8 ref.

Descriptors: "Computer models, "Alluvial aquifers, "Hydrogeology, Groundwater resources, Groundwater availability, Drawdown, Pumping, Water wells, Transmissivity, Specific yield, Groundwater recharge, Equations, Model studies, Water levels, "Costa Rica, Interference, Well loss, Finite-difference technique.

The hydrogeology of the area was discussed, and the method used in producing a digital model simulation of the alluvial aquifer was described. The availability of groundwater resources in the area is indicated by modelled areal abstractions and drawdown modified by a simple 'worst well' concept of well interference and well loss. Introducing this concept reduces the postulated allowable areal abstraction in the study area by 50%. (Visocky-ISWS) ISWS) W79-00311

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUS-

TRALIA,
Australian Atomic Energy Commission, Lucas
Heights, New South Wales (Australia). Isotope

Journal of Hydrology, Vol. 38, No. 3/4, p 343-355, August 1978. 6 fig, 3 tab, 19 ref.

Descriptors: "Geochemistry, "Isotope studies, "Australia, Aquifers, Sampling, Water quality, Carbon radioisotopes, Deuterium, Oxygen isotopes, Wells, Carbonates, Rain, Groundwater recharge, Hydrogeology, Arid climates, Depth, Graphical analysis.

The town of Alice Springs is situated within the arid zone of central Australia and derives its water supply from production bores in Mereenie Sandstone. Twenty-nine samples of this water and other surrounding water have been analyzed for their chemical, radiocarbon, stable carbon, deuterium, and 180 composition to investigate recharge to the quifer system. The measures 14C contents range from 5.1 to 63.4% modern. There is no correlation between borehole depth and nercontents range from 5.1 to 63.4% modern. There is no correlation between borehole depth and percentage modern carbon; however, the samples fall into several groups when the percentage modern carbon is plotted against the reciprocal of the total carbonate content. Within each group, the delta D and delt 180 values are constant and isotopically much lighter than the average annyal rainfall value. It is believed that each group represents a single recharge event, and that recharge to the aquifer system occurred at intervals of a few millennia, when climatic conditions were different from those of today. (Visocky-ISWS)

HYDROGEOCHEMISTRY OF A CALCRETE-CONTAINING AQUIFER NEAR LAKE WAY, WESTERN AUSTRALIA, Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of

Organization, Wellioly (1838-1839), Mineralogy,
A. W. Mann, and R. L. Deutscher.
Journal of Hydrology, Vol. 38, No. 3/4, p 357-377,
August 1978. 7 fig, 2 tab, 29 ref.

Descriptors: "Hydrogeology, "Geochemistry, "Groundwater, "Playas, "Australia, Aquifers, Sampling, Water quality, Carbonates, Equilibrium, Hydrogen ion concentration, Calcite, Dolomite, Gypsum, Mineralogy, Arid climates, Semi-arid climates, Wells, Rain, Weathering, Evaporation, Evapotranspiration, Bicarbonates, Chlorides, Silicates, Clays, "Calcrete, Carbonate equilibria.

Twenty-six water samples from representative sampling locations within a calcrete-containing drainage have been chemically analysed and the results processed to obtain information relevant to the genesis of calcrete. Comparison of major-element concentrations with that of Cl(-) suggests chemical precipitation of Ca(2+), Mg(2+), SO4(2-) and silica within the drainage basin. The HCO3(-) ion concentration is independent of Cl(-) ion concentration (r = 0.30). Groundwater pH appears to be determined by interaction of silica minerals with groundwater and to a lesser extent by carbe determined by interaction of silica minerals with groundwater and to a lesser extent by carbonate equilibria wherever calcite occurs. Calculated solubility indices give an accurate representation of the distribution of calcite, dolomite, aragonite, silica, gypsum and sepiolite within the drainage basin. Carbonate equilibria appropriate to 25C have been applied to all samples to obtain from the measured HCO3(-) concentration, activities for H2CO3, CO3(2-), and P sub CO2 values the mean P sub CO2 is 10 to the c.201 + or 0.28 ues for H2CO3, CO3(2-), and P sub CO2 values-the mean P sub CO2 is 10 to the -2.01 + or - 0.28 power bar. Equilibration of neutral of slightly al-kaline groundwaters with this CO2 is responsible for the production of CO3(2-) ion activities of the order of 0.00001 required for precipitation of Ca-Mg carbonate. (Visocky-ISWS) W79-00323

FORMATION OF A VERMICULITE MINERAL FROM GROUND WATER COMPONENTS (IN

FROM GROUND WATER COMPONENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
For primary bibliographic entry see Field 2K.
W79-00382

HYDROGEOLOGY OF THE GRANDE PRAIRIE AREA, ALBERTA, Research Council of Alberta, Edmonton.

D. Hackbarth. Report 76-4, 1977. 17 p, 4 fig, 1 tab, 21 ref.

Descriptors: *Hydrogeology, *Canada, *Groundwater, Geologic mapping, Aquifers, Groundwater movement, Groundwater resources, Water wells, Pumping, Water yield, Transmissivity, Base flow, Geochemistry, Dissolved solids, *Alberta(Canada).

The Grande Prairie map area is located between longitudes 118 deg west and 120 deg west and latitudes 55 deg north and 56 deg north. It covers approximately 6,000 sq mi (15,500 sq km). Precipitation is about 18 in (46 cm) annually, while the potential evapotranspiration is about 19 in (48 cm). Geological units of hydrogeological interest include the surficial deposits, the Wapiti Formation, and the Smoky Group. The latter two are of Late Cretaceous age. The region is divided into two hydrogeological areas: (1) a southern area in which groundwater is abundant, with 20-year safe yields of 25 igpm (2 l/s) common and water of reasonably good quality, and (2) a northern area in which groundwater is not usually available and is of very poor quality. In addition to the 1:250,000 scale groundwater availability map, maps at

1:1,000,000 scale present the hydrochemistry of the surficial deposits and of the bedrock. (Visocky-ISWS) W79-00470

2G. Water In Soils

EFFECTS OF MUNICIPAL SEWAGE EF-FLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS, State Univ. of New York at Syracuse. Coll. of En-For primary bibliographic entry see Field 5C.
W79-00009

DETERMINATION OF TERRESTRIAL ALBEDO FROM LANDSAT I SATELLITE IMAGERY IN PHOTOGRAPHIC FORM, Arizona Water Resources Research Center, Tuc-For primary bibliographic entry see Field 7B. W79-00012

IRRIGATED SOILS OF THE MILSKAYA PLAIN (IN RUSSIAN),

M. P. Babaev. Izv Akad Nauk Az Ssr Ser Biol Nauk 3, p 64-68, 1975.

Descriptors: *Irrigated soils, *M Plain(USSR), *Soils, USSR, Water regime. *Milskava

In the Miliskaya plain (USSR) under the effect of century-long and intense irrigation there was a change in the water regime (an irrigation-hydromorphic water regime was established in the irrigated soils) in the direction of the soil formation process, and the irrigated soils were enriched with nutrient elements. There is a need for a detailed study of the diagnostic features and refinement of the nomenclature and the development of new methods of survey of irrigated soils.

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET, Food and Drug Administration, Washington, DC. Div. of Chemistry and Physics.
For primary bibliographic entry see Field 5A.
W79-00080

SOIL, WA WATER AND AIR SCIENCES Science and Education Administration, Washington, DC.

Navailable from Supt. Doc., U.S. Gov't. Print. Off., as Stock No. 001-007-00902-2. Annual Report, 1978. 270 p, 741 ref.

Descriptors: "Water resources, "Land use, "Soil conservation, "Water conservation, "Natural resources, Irrigation, Drainage, Saline soils, Soil physical properties, Fertility, Environmental effects, Land reclamation, Crops, Revegetation, Erosion control, Solar radiation, Wind energy, Sediment control, Agricultural runoff, Agricultural chemicals, Flood control, Reservoir sedimentation, Cultivation, Air pollution effects, Pesticides, Phytotoxicity, Crop production, Precipitation(Atmospheric), Water pollution, Soil contamination.

Scil, water and air sciences research carried out under nine National Research Programs and one Special Research Program, are briefly described. The programs deal with the following subjects: (1) assessment and reduction of salt damage to crops, soils, and eaters; (2) improvement of irrigation and drainage for more efficient crop production; (3) development of tillage practices for improved crop production, reduced costs and energy consumption, and improved conservation of soil and water;

Field 2-WATER CYCLE

Group 2G-Water In Soils

(4) more efficient use and management of solar and wind energy and precipitation; (5) revegeta-tion and reclamation of land areas disturbed by tion and reclamation of land areas disturbed by man; (6) management and conservation of soil fertility for increased production and enhanced nutritional quality of plant and animal products; (7) prevention or reduction of environmental pollution resulting from agricultural or other practices; (8) prediction of water yields, sediment amounts and sources, and agricultural chemical loadings in streams and rivers; (9) control of flooding, reservoir sedimentation, soil erosion, and chemical transport by wind and water. (Majtenyi-IPA) W79-00105

USE OF DUMMY VARIABLES IN WATER USE OF DUMMY VARIABLES IN WATER RESOURCES STUDIES, Florida Univ., Belle Glade. Inst. for Food and Agricultural Sciences. S. F. Shih, and W. F. P. Shih. Journal of Hydrology, Vol. 38, No. 3/4, p 289-298, August 1978. 2 fig, 1 tab, 16 ref.

Descriptors: "Water resources, "Land subsidence, "Water levels, "Analytical techniques, "Florida, Agriculture, Crops, Land use, Subsidence, Regression analysis, Soil-water-plant relationships, Statistics, Statistical methods, Soil water, Groundwate, Dummy variables.

Dummy variables 1 and 0 used as an alternative to analyze the variance and convariance to compare the relationship among groups of observations were introduced. Seven-year data of organic soil subsidence in Everglades Agricultural Area related to water table depth and crop were used to demonstrate the techniques of application. Comparisons of the performance of this dummy variable technique with the standard technique were made. The results showed that the dummy variable regression not only can perform a good result as performed by the standard technique, but also can simultaneously test the difference between two regression lines whether due to slope coefficients regression lines whether due to slope coefficients or to intercept terms. (Sims-ISWS)

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, I. TRACER STUDIES, New South Wales, Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-00115

A FIELD EVALUATION OF SUBSURFACE AND SURFACE RUNOFF, II. RUNOFF PROCESSES, New South Wales Univ., Kensington (Australia). School of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-00116

RATIONAL DETERMINATION OF DERDRAINAGE SYSTEM FROM THE HYDRAULIC POINT OF VIEW: STUDIES ON UNDERDRAINAGE OF CLAYEY PADDY SOIL:

III. (IN JAPANESE), Kyoto Univ. Japan). Faculty of Agriculture. Y. Fujioka, and T. Maruyama. Trans Jap Soc Irrig Drain Reclam Eng. 37, p 33-38,

Descriptors: Measurement, *Clayey, *Drainage, Equations(Hydraulic), Paddy soils, Soils.

Previously, underdrainage discharge was customarily expressed as standard value of 1 l/s/ha when planning an underdrainage system. This standard measurement is insufficient in an underdrainage system where the soil permeability is very high. The capacity of the underdrainage system must be determined after taking into con-sideration soil permeability and permissible sideration soil permeability and permissible drainage velocity. An equation was derived show-ing the relation among underdrainage discharge,

water level at the laterals and main drain, and the quantity of storage water at the soil surface by using the relation of the underdrainage discharge and water logged area. This equation was express in finite difference and the calculations were carin finite difference and the calculations were carried out by the relaxiation method. This equation was confirmed by comparison with experimental data obtained for clayey paddy field. As an example of application of this theory, it is possible to carry out rational planning of the underdrainage system which could not be done before with the help of this theory since the equation takes into the consideration solution of problems which arise from the difference in quantity of ponded water at different paddy fields and also the time required for drainage.—Copyright 1974, Biological Abstracts, Inc. W79-00199

CORRELATION BETWEEN THE SALT CON-TENT IN THE HARD PHASE AND SOIL SOLU-TIONS OF THE MURGHAB OASIS DESERT-MEADOW SOILS OF ANCIENT IRRIGATION, (IN RUSSIAN).

G. V. Vinogradova. Probl Osvo Pustyn' 4, p 82-84, 1975.

Descriptors: *Salinity, *Saine soils, Ancient history, Deserts, *Irrigation, Meadows, Murchab, Oasis, Salts, Soils, Turkmen-SSR, USSR.

Comparison of data from analyses of aqueous ex-tracts and soil solutions of Murghab oasis (Turkman SSR, USSR) soils indicated that the extracts and solutions differed significantly in total content of salts and individual ions. This difference was less expressed in the salinized soils since easily soluble Na SO4 and MgSO4 and NaC since easily soluble Na SO4 and MgSO4 and NaCl are found in the salts of these soils. In unsalinized soil, where the salts are represented by weakly soluble CaSO4, and calcium bicarbonate, the aqueous extract gave exaggerated indices, converting soil hard-phase components into solution during extraction. The greatest difference between the soil solutions and aqueous extracts was exhibited by HCO3, SO4 and Ca ions, which were greater in the aqueous extracts.—Copyright 1976, Biological Abstracts, Inc.
W79-00203

WATER AND PHYSICAL PROPERTIES OF SOD-CALCAREOUS SOILS CRIMEAN FOOTHILLS (IN RUSSIAN), L. F. Kaplyuk. Pochvovedenie 5, p 104-114, 1976.

Descriptors: *Calcareous soils, *Soil physical properties, Sods, Aggregates, Climates, E Forest, Leaching, Sites, USSR, Vegetation.

A description is given of the microclimate, physical geography, and aggregate properties and water constants of the sod-calcareous soils of the steppe-forest belt on the north slope of the Crimean Mountains (Ukrainian SSR, USSR) formed on the eluvial and eluvial-deluvial limestones, layers of covering gravel and other carbonate deposits. The soils vary in thickness, mechanical composition, degree of storminess, leaching and erosion due to wide variances in soil-forming factors, e.g., the characteristics of the complex mountain relief and plant cover. Highly skeletal and eroded soils extinct the state of the complex mountain relief and plant cover. Highly skeletal and eroded soils extinct the state of the complex mountain relief and plant cover. plant cover. Highly skeletal and croucu sons ca-hibit unsatisfactory water and physical properties; more favorable conditions for forest cultures are found in areas with thick, weakly rocky soils or thin soils with small grained (melkozem) or weakly fragmented upper (arable) levels. Eroded, rocky soils containing little melkozem are unsuitable for Copyright 1978, Biological Abstracts, Inc.
W79-00269

A LYSIMETRIC STUDY OF WATERS IN AN IR-RIGATED PASTURE (IN RUSSIAN), Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Meadow Science.

V. A. Tyuldyukov, and A. D. Prudnikov Izv Timiryazev S-Kh Adad 5, p 98-107, 1977.

Descriptors: Calcium, Grass, *Leaching, Magnesium, Nitrogen, *Nutrients, Phosphorus, Potassium, *Pastures, *Soil moisture, *Lysimetry, um, *Pastures *Podzolic soils.

The effect of different moisture regimes of soddy-podzolic soils on vertical moisture filtration in the 1st meter of soil, pH and chemical composition of 1st meter of soil, pH and chemical composition of lysimetric waters, and leaching of the main mineral elements of grass nutrition were studied on the irrigated cultivated pasture of Moscow (USSR) region by means of lysimeters. Keeping the soil moisture at the 70% level of field capacity in the 0-40 layer cm ensures the lowest water filtration and insignificant leaching of N, P and K from the top meter. The most intensive nutrient leaching, especially of Ca and Ma. from the soddop meter. The most intensive nutrient leaching, especially of Ca and Mg, from the soddy-podzolic soil occurs in spring and autumn. Excessive moisture results in inefficient water utilization.—Copyright 1978, Biological Abstracts, Inc. W79-00284

FIELD OBSERVATIONS OF THE MOISTURE REGIME OF A YELLOW-GREY EARTH (OTOKIA SILT LOAM) IN EASTERN OTAGO, Department of Scientific and Industrial Research, Havelock North (New Zealand). Soil Bureau. J. P. C. Watt.

Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 53-72, 1977. 6 fig. 5 tab, 18 ref.

Descriptors: *Soil moisture, *Loam, *On-site data Descriptors: "Soil mossure, "Loam, "On-site day collections, "Moisture blocks, Silts, Moisture con-tent, Moisture tension, Wilting point, soil horizons, Depth, Soil profiles, Gravimetric analy-sis, Bulk density, "New Zealand, Neutron probe.

The moisture regime of yellow-grey earths has been inferred qualitatively in the past from climate analysis and pedologic interpretation. In this study, quantitative information was obtained. Field measurements, collected over a 3-4 year period, of the moisture tension and moisture content regimes of a model Otokia silt loam (Tokomairiro soil set) site provided data on changes in both moisture status and storage opportunity. The overall regime is characteriz periods of high moisture tension (at or drier than wilting point) in the A and B horizons through summer, and periods of low moisture tension (at or wetter than field capacity) in most horizons in winter. Within the limited range of moisture ten-sions commanded by resistance block determina-tions were shown to be compatible. (Visocky-ISWS) W79-00310

RECLAMATION OF MEADOW-CHERNOZEM SOLONETZES OF THE KUSTANAI OBLAST, (IN RUSSIAN),

Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.

A. F. Novikova. Pochvovedenie (6), p 69-79, 1977.

Descriptors: *Chernozems, *Solonetzer, *Soils, Kustanai Oblast(USSR), Land reclamation, Cul-

A characteristic of water-physical, physico-chemical and reclamative properties of meadow-cher-nozemic low in sodium solonetzes of Kustanai re-gion (USSR) is given. The effect of different practices (tillage, cropping) on changes in physical pro-perties and water regime of developing meadow-chernozemic soils low in sodium solonetzes was studied, and recommendations on their develop-ment were given.-Copyright 1978, Biological AbFORE UNDI PRAC Tiflis For p

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CHANGES IN WATER REGIME OF BROWN FOREST SOILS OF THE GEORGIAN SSR UNDER THE EFFECT OF SILVICULTURAL PRACTICES, (IN RUSSIAN), Tidlis Inst. of Forestry (USSR). For primary bibliographic entry see Field 4C, W79-00401

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POSSIBLE USE OF POLYMERIC MATERIALS FOR FORTIFICATION OF DRAINAGE FILLS (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation.
For primary bibliographic entry see Field 4A.
W79-00439

RELATIONSHIPS AMONG SOME PHYSICAL PROPERTIES OF SOIL (IN SLOVENIAN), Vyskumny Ustav Rastlinnej Vyroby, Piestany (Czechoslovakia).

J. Kosik, and T. Mistina.

Ved Pr Vysk Ustavu Rastlinnej Vyroby Piestanoch (12), p 125-134, 1974.

Descriptors: "Soil physical properties, "Soil moisture, Bean, Birdsfoot, "Capillary water capacity, Red clover, Lucerne, Oats, "Porosity, Sainfoin, Sunflower, Trefoil, "Soil aggregates.

Soil moisture content, reduced specific volume of Soil moisture content, reduced specific volume or soil, total porosity, maximum capillary water capacity, coefficient of structure and median wt mean of water stable soil aggregates were in-vestigated. The soils were grown to sainfoin, lucerne, red clover, birdsfoot trefoil, maize, sun-flower, broad bean and oats. Correlation analysis was made of the mean values of soil properties was made of the mean values of soil properties under the particular crops to a depth of 40 cm. The coefficient of multiple correlation was significant in the following order: maximum capillary water capacity (0.612-0.763), reduced specific volume (0.815-0.951) and total porosity of soil (0.889-0.961). The coefficient of structure was highly significant under the group of perennial crops (0.578-0.701). Partial correlation coefficients or partial regression coefficients, except for negative correlation between the reduced specific volume and the total porosity of soil, demonstrate a positive relation between the coefficients of structure and the total porosity of soil under legumes. A positive relation between the coefficients of structure and the total porosity of soil under legumes. A positive relation between the coefficients of structure and the total porosity of soil under legumes. A positive relation was observed between the maximum capillary water capacity and the total porosity (under annual crops) and a negative correlation between the soil moisture content and the coefficient of structure (under sainfoin and birdsfoot trefoil).—Copyright 1978, Biological Abstracts, Inc. W79-00451

METHODICAL PROBLEMS IN THE EVALUA-TION AND MAPPING OF EROSION-ENDAN-GERED LANDS (IN RUSSIAN), Moscow State Univ. (USSR). Research Lab. of

Soil Erosion.

For primary bibliographic entry see Field 2J. W79-00462

STEADY INFILTRATION FROM SINGLE AND PERIODIC STRIP SOURCES, Wisconsin Univ.-Madison. Dept. of Soil Science. V. Batu.

V. Batu. Soil Science Society of America Journal, Vol. 42, No. 4, p 544-549, July-August 1978. 7 fig, 15 ref.

Descriptors: *Infiltration, *Soil water movement, *Theoretical analysis, *Mathematical models, Equations, Sprinkler irrigation, Hydraulic conductivity, Potential flow, Strip sources.

The matric flux potential and horizontal and verti-cal flux distributions were obtained using Fourier analysis techniques for single and periodic strip sources located on the soil surface. The theory is based on the assumption that the hydraulic con-

ductivity is an exponential function of the soil water potential. The matric flux potential distributions were compared with the results obtained by Warrick and Lomen, who used different mathematical techniques. (Visocky-ISWS) W79-00471

SOLUTE TRANSPORT DURING ABSORPTION

SOLUTE TRANSPORT DURING ABSORPTION OF WATER BY SOIL: LABORATORY STUDIES AND THEIR PRACTICAL IMPLICATIONS, Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmental Mechanics.

D. E. Smiles, and J. R. Philip.
Soil Science Society of America Journal, Vol. 42, No. 4, p 537-544, July-August 1978. 4 fig. 1 tab, 14 ref.

Descriptors: *Infiltration, *Absorption, *Solutes, *Soil water movement, Leaching, Unsaturated flow, Soils, Soil water, Unsteady flow, Capillary action, Dispersion, Laboratory tests, Soil science, Solute transport.

An experimental study of solute transport during absorption into uniform horizontal soil columns was reported. Three pairs of experiments were performed. Each pair had a common initial moisture content (0.04, 0.1, or 0.15), with one experiment involving displacement of concentrated soil solution by dilute solution and the other, vice versa. In all experiments, both the soil solution content and the salt concentration preserved similarity in terms of distance divided by square root of time. This confirmed earlier observations that the longitudinal dispersion coefficient for the conditions of these experiments is effectively inconditions of these experiments is effectively in-dependent of volume flux density. The inferred dispersion coefficient was essentially independent also of the volumetric moisture content (at least in also of the volumetric moisture content (at least in the range 0.18-0.28). It was approximately equal to the product of the volumetric moisture content and the molecular diffusivity of KCl in water. The practical implications of the work for field problems were explored, use being made of scaling theory for flow processes involving capillarity and viscous flow. It was concluded that, for the majority of field soils, solute transport during unsaturated flow of any practical duration may be described by a velocity-independent dispersion coefficient. This represents a very great simplification of the formulation, analysis, and prediction of solute transport in such systems. (Sims-ISWS) W79-00472

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES, Purdue Univ., Lafayette, IN. Agricultural Experi-

ment Station. Stuff, and R. F. Dale.

Soil Science Society of America Journal, Vol. 42, No. 4, p 637-642, July-August 1978. 9 fig, 1 tab, 15

Descriptors: *Water balance, *Soil moisture, *Water table, *Model studies, *Indiana, Evapotranspiration, Capillary action, Moisture deficit, Moisture stress, Crops, Evaporation pans, Root zone, Corn(Field), Soil moisture extraction, Holding capacity.

Soil moisture balance programs developed on well-drained soils were found to be unsatisfactory for a soil underlain by shallow water tables, a con-dition typical of about 9 million acres of cropland dition typical of about 9 minon acres of croptand in Indiana. Capillary rise past a 105-cm root zone boundary was estimated as the difference between estimated evaportranspiration (ET) and changes in soil moisture under corn on a tile-drained Typic Argiaquoll at West Lafayette, Indiana, during 3 Argiaquoll at west Latayette, Indiana, during 3 growing seasons, 1971-1973. Capillary water was found to supply an average of 27% of the ET in periods with little or no precipitation. Computer model estimates showed capillary water to furnish about 17% of the total ET over a 100-day period

from 49 days before silking to 50 days after. The derived relationships with those obtained from literature sources and assumptions regarding runoff and recharge were programmed in a computer model for simulating the daily moisture status and changes in the corn root zone. Model inputs were pan evaporation, precipitation, soil moisture characteristics, corn silking date, and initial soil moisture conditions. The model was found to closely track measurements of both soil moisture moisture conditions. The model was found to closely track measurements of both soil moisture and water table depths in 4 independent seasons: early and late plantings in 1970 and 1974. (Visocky-ISWS) W79-00473

WATER RELATIONS OF FRITTED CLAYS, Texas A and M Univ., College Station. Dept. of Soil and Crop Sciences. C. H. M. van Bavel, R. Lascano, and D. R. Wilson. Soil Science Society of America Journal, Vol. 42, No. 4, p 657-659, July-August 1978. 3 fig, 6 ref.

Descriptors: *Clays, *Materials, *Plant growth substances, Properties, Hydraulic conductivity, Bulk density, Water content, Drainage, Porous media, Porosity, Soils, Soil properties, Soil water, Materials testing, Soil science, *Fritted clay,

Experiments and calculations were performed to characterize the water relations of fritted clay, a material which has been found suitable for growing experimental plants. Fritted clay dry bulk density is 0.67 kg/liter, particle density 2.50 kg/liter, total porosity 0.73, and saturated hydraulic conductivity 0.00095 m/sec. The desorption relation was measured, and the unsaturated hydraulic conductivity as a function of water content was calculated. Much water drains from the saturated material by gravity. After drainage from commonly used containers, the material holds 0.31 by volume of plant-available water, and has an airfilled porosity of 0.28. Its water relations are excellent for plant growth purposes. (Sims-1SWS) lent for plant growth purposes. (Sims-ISWS) W79-00476

SELECTION,
Science and Education Administration, Temple,
TX. Grassland-Forage Research Center.
For primary bibliographic entry see Field 4A.
W79-00484

DENITRIFYING BACTERIA CAN BE ENU-MERATED IN NITRITE BROTH, Connecticut Agricultural Experiment Station,

New Haven. M. G. Volz.

Soil Science Society of America Journal, Vol. 41, NO. 3, p 549-551, May-June 1977. 2 tab, 20 ref.

Descriptors: *Denitrification, *Bacteria, *Nitrites,

Denitrifying- and NO3- reducing bacteria in air dry, moist and organic matter amended Yalesville fsl, lake water, and in both effluent and drainage field soil from a septic tank system were enumerated using Difco nutrient broth, which contained either or both NO3- and NO2- and was incubated anaerobically. Most probable numbers (MPN) of denitrifiers were always less than those of NO3- reducers in the same sample, and constituted from 0.02% to 70% of bacteria capable of aerobic growth on yeast extract agar. (Skogerboe-Colorado State)
W79-00498 W79-00498

PROFILE ACCUMULATION OF FERTILIZER-DERIVED NITRATE AND TOTAL NITROGEN RECOVERY IN TWO LONG-TERM NITROGEN-RATE EXPERIMENTS WITH

Iowa Agricultural and Home Economics Experiment Station, Ames.

Field 2-WATER CYCLE

Group 2G-Water In Soils

V. D. Jolley, and W. H. Pierre. Soil Science Society of America Journal, Vol. 41. No. 2, p 373-378, March-April 1977. 1 fig, 5 tab, 26

Descriptors: *Fertilizers, *Fertilization, *Nitrates, Nitrogen, *Corn(Field), *Crop response, Soils, Soil investigations, Soil profiles, Denitrification.

Two long-term N-rate experiments with corn which had been conducted in northwestern Iowa on the Moody and Galva silty clay loam soils for 17 and 15 years, respectively, were studied to determine the recovery of applied N (i) as NO3(-)N at various soil depths, (ii) as organic or fixed N, and (iii) as N removed in the harvested corn gran. and (iii) as N removed in the harvested corn gran. The annual N rates applied as NH4NO3 were 0, 56, 112, and 168 kg N/ha on the Moody soil and 0, 90, and 134 kg N/ha on the Galva soil. Nitrogen recovery in the fertilized plots was determined by subtracting the amounts for the unfertilized treatment from those for the fertilized treatment from those for the fertilized treatments. (Skogerboe-Colorado State)

2H. Lakes

NUTRIENT LOADING/LAKE TROPHIC CON-DITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSH-ING RATE, Maine Univ. at Orono.

For primary bibliographic entry see Field 5C. W79-00001

THE EFFECTS OF HEAVY METALS ON ALGAE POPULATIONS IN A SOUTH CEN-

Arkansas Univ., Fayetteville. Dept. of Botany and Bacteriology. For primary bibliographic entry see Field 5C. W79-00011

ECOLOGY OF DREISSENA POLYMORPHA (PALL.) (DREISSENIDAE, BIVAL LAKES RECEIVING HEATED BIVALVIA) DISCHARGES, Polish Academy of Sciences, Poznan (Poland).

Inst. of Applied Zoology.
For primary bibliographic entry see Field 5C.
W79-00068

GENERATION AND PROPAGATION OF DOWNWELLING FRONTS, Canada Centre for Inland Waters, Burlington

(Ontario). T. J. Simons Journal of Physical Oceanography, Vol. 8, No. 4, p 571-581, July 1978. 19 fig, 22 ref.

Descriptors: *Water circulation, *Lake Ontario, *Winds, *Great Lakes, *Model studies, Mathe-

matical models, Lakes, Circulation, Internal waves, Currents(Water), Limnology, Downwelling, Downwelling fronts, Fronts(Water).

The dynamics of downwelling fronts observed along the steep and elongated southern shore of Lake Ontario were investigated by considering the nonlinear response to surface forcing of one-layer and two-layer fluids on a rotating, semi-infinite plane. Analytical and numerical solutions for idealized situations exhibited typical charac-teristics of the observed fronts such as offshore propagation and periodic recurrence with near-inertial periods. A numerical simulation of an acutal downwelling episode in Lake Ontario showed that downveiling episode in Lake Ontario showed that this type of model reproduces the observed behavior of the thermocline as well as the as-sociated oscillatory currents. It was concluded that the fronts are to be visualized as internal surges associated with the oscillatory rather than the quasi-geostrophic response of a lake to wind. (Sims-ISWS)

W79-00128

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART I: ONE-DIMENSIONAL GRAVITY WAVE MO-

National Oceanic and Atmospheric Administra-tion, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 2L. W79-00129

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART II: TWO-DIMENSIONAL GRAVITY WAVE MO-

National Oceanic and Atmospheric Administra-tion, Miami, FL. Atlantic Oceanographic and Atmospheric Labs.
For primary bibliographic entry see Field 2L.
W79-00130

NUMERICAL COMPUTATION OF THREE-DIMENSIONAL CIRCULATION IN LAKE ERIE: A COMPARISON OF A FREE-SURFACE MODEL AND A RIGID-LID MODEL, Case Western Reserve Univ., Cleveland, OH.

Y. P. Sheng, W. Lick, R. T. Gedney, and F. B. Molls.

Journal of Physical Oceanography, Vol. 8, No. 4, p 713-727, July 1978. 16 fig. 23 ref.

Descriptors: *Water circulation, *Lake Erie, *Great Lakes, *Model studies, Mathematical models, Computer models, Circulation, Currents(Water), Winds, Seiches, Remote sensing, Satellites(Artificial), Eddies, Flow, Limnology, Free-surface models, Rigid-lid models.

The three-dimensional, time-dependent flow in the Western Basin of Lake Eric has been calculated numerically by means of both a two-mode freesurface model and a rigid-lid model. Detailed comparisons of the results from these two models were presented for two wind conditions: (1) a constant wind suddenly imposed, and (2) an actual wind which is variable in both space and time. For relatively short time intervals, significant differences between the results of the two models occur since the seiche motion was eliminated in the rigid-lid model. Long-term, time-averaged circulation computed by the two models agreed well in periods of strong wind, but differed appreciably in periods of light wind and active seiching. (Sims-ISWS) 79-00132

SURVIVAL AND OXYGEN CONSUMPTION OF YOUNG KURA CARP UNDER AND ING CONDITIONS (IN RUSSIAN), Nauchno-Iss-YOUNG KURA CARP UNDER VARIOUS KEEP-

Tsentralnyi Gosudarsivennyi Naucinio-133 ledovatelskii Inst. Ozernogo i Rechnogo Rybnogo Khozyaistva, Baku (USSR). Azerbaijan Branch. Gidrobiol Zh 11(3), p 76-77, 1975.

Descriptors: *Carp, Kura carp, Larvae, *Oxygen consumption(Carp), *Salinity, Survival, Temperature, Juveniles, Fish hatcheries.

Experiments were carried out on Kura River carp (Cyprinus carpio) to establish the minimum O2 content for survival of the larvae and fry under hatchery conditions, the upper limit of salinity, ac-tivity of the fry at different temperatures and salinities and the temperature optimum of the juveniles. Salinity above 4% on larvae and above 6% on fry had an inhibiting effect. Fry at an age of 38 days preferred a water temperature of 27C. O2 consumption per unit time by the fry decreased with decreasing 0 saturation.--Copyright 1976, Biological Abstracts, Inc. W79-00180

THE PRODUCTIVITY OF A RANGE OF BLAN-KET BOG VEGETATION TYPES IN THE NORTHERN PENNINES, Nature Conservancy, Alston (England). Moore House Field Station. For primary bibliographic entry see Field 21. -00202

AN INVESTIGATION OF PRIMARY PRODUC-TION AND ECOSYSTEM METABOLISM IN A LAKE MICHIGAN DUNE POND, Michigan State Univ., East Lansing. Dept. of Botany. ary bibliographic entry see Field 5C. For primar W79-00205

WATERHYACINTH (EICHHORNIA CRAS-SIPES) NUTRIENT UPTAKE AND METABOL-ISM IN A NORTH CENTRAL FLORIDA MARSH Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5C.
W79-00206

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER DIATOMS Cologne Univ. (Germany, F.R.) Botanisches Inst. For primary bibliographic entry see Field 5C. W79-00208

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UP-TAKE, New York State Dept. of Health, Albany. En-vironmental Health Center.

For primary bibliographic entry see Field 5C. W79-00211

SEASONAL CHANGES IN RESPIRATORY EN-ZYME ACTIVITY AND PRODUCTIVITY IN LAKE WASHINGTON MICROPLANKTON, Washington Univ., Seattle. Fisheries Research Inst. For primary bibliographic entry see Field 5C. W79-00212

PHYTOPLANKTON EXTRACELLULAR RELEASE AND ITS RELATION TO THE SEASONAL CYCLE OF DISSOLVED ORGANIC CARBON IN A EUTROPHIC LAKE, State Univ. of New York at Fredonia. Environ-mental Resources Center. For primary bibliographic entry see Field 5C. W79-00213

BENTHIC ALGAE IN A POND AFTER THE ACCUMULATION OF BEET-SUGAR FACTORY Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod. For primary bibliographic entry see Field 5C. W79-00216

PHYTOPHILOUS FAUNA IN PONDS FERTIL-IZED WITH SUGAR FACTORY WASTES, Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod. For primary bibliographic entry see Field 5C. W79-00217

THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL, Michigan Univ., Ann Arbor. Sea Grant Program. For primary bibliographic entry see Field 5B. W79-00249

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LAKE, UTAH, Geological Survey, Salt Lake City, UT., Water Resources Div. T. Arnow, and L. J. Jensen.
In: Desertic Terminal Lakes; Proceedings of the International Conference on Desertic Terminal Lakes, held in Ogden, Utah, May 2-5, 1977, p 73-

Descriptors: *Great Salt Lake, *Utah, *Water level fluctuations, Hydrology, Inflow, Evapora-tion, Consumptive use, Railroads, Bridges, Ef-fects, Data collections.

The level of Great Salt Lake, Utah, fluctuates con-The level of Great Salt Lake, Utah, fluctuates continuously in response to climatic changes and tends to maintain an equilibrium between inflow from surface and ground water and precipitation and loss by evaporation. For the period 1847-75, the surface level was computed indirectly; during 1875-1938, the level was measured periodically at staff gages; and since 1938, the level has been stati gages; and since 1939, the level has been measured continuously. During the 130 years of record, the lake has fluctuated over a range of 20 feet. The consumptive use of water as a result of man's activities in the Great Salt Lake drainage basin since 1847 has resulted in a lowering of the basin since 1847 has resulted in a lowering of the lake level by 5 feet. Since 1959, a railroad causeway has separated the lake into two parts. Although the causeway is permeable and is breached by two 15-foot wide box culverts, it has caused a difference in surface level between the two parts of the lake. The maximum recorded difference of level was 2.35 feet in June 1975.

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT, Versar, Inc., Springfield, VA. For primary bibliographic entry see Field 5B. W79-00289

REPORT OF A DEMATIACEOUS HYPHO-MYCETE FROM THE GREAT SALT LAKE,

UTAH, Utah State Univ., Logan. Dept. of Biology. E. A. Cronin, and F. J. Post. Mycologia, Vol. 59, No. 4, p 846-847, July-August, 1977. 4 fig, 3 ref. OWRT-A-024-UTAH(4), 14-34-

Descriptors: *Halophiles, *Hyphomycetes, *Cladosporium, Utah, Lakes, *Great Salt Lake(Utah).

A hyphomycete was observed from the north arm of the Great Salt Lake, Utah, and identified as a species of Cladosporium. The lake was about 300 g l-1 solids. W79-00297

A PROCARYOTIC INTRACELLULAR SYMBIONT OF THE GREAT SALT LAKE BRINE SHRIMP ARTEMIA SALINA (L.), Utah State Univ., Logan. Dept. of Biology. F.J. Post, and N. N. Youssef. Canadian Journal of Microbiology, Vol. 23, No. 9, p 1232-1236, 1977. OWRT-A-024-UTAH(5), 14-34-0001-6046.

Descriptors: *Brine shirmp, Symbionts, Halophiles, Utah, Lakes, Great Salt Lake(Utah), Artemia salina, Procarotic symbiont.

Individuals of Artermia salina, the brine shrimp, were captured from the Great Salt Lake, a highly saline (330-340 g l-1 solids content) terminal lake in saline (330-340 gt-1 solids content) terminal take in Utah. Electron microscopy revealed the presence of intracellular procaryotic symbionts in the epithelial lining of the midgut. Fine structure and possible role of the symbiont are discussed. W79-00298

SEVEN PROBLEMS IN BUBBLE AND JET
DROP RESEARCHERS,
State Univ. of New York at Albany. Atmospheric
Sciences Research Center.
For primary bibliographic entry see Field 8B.
W79-00319
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Agricultural

NUTRITION AND GROWTH OF THE BIGHEAD ARISTICHTHYS NOBILIS (RICH.) IN BODIES OF WATER OF THE DAGESTAN ASSR, Kaspiiskii Nauchno-Issledovatelskii Inst. Rybnogo Khozyaistva, Makhachkala (USSR). Dagestanskii Div.
L. P. Lazareva, M. O. Omarov, and A. N. Lezina. Vopr Ikhtiol 17(1): 72-79. 1977 (In Russ. with Russ.

Descriptors: "Nutrient requirements, "Fish diets, Lakes, Ponds, Zooplankton, Phytoplankton, Aging(Biological), Fry, Diets, Detritus, "Bighead, Russian-SFSR, USSR, Yearlings.

The basic food component of A. nobilis larvae of stages III-IV in ponds and lakes of the Dagestan ASSR (Russian SFSR, USSR) was zooplankton. The role of zooplankton decreased and that of phytoplankton increased as the fish grew older. As phytoplankton increased as the fish grew older. As a result of poor zooplankton reserves in the studied areas, fingerlings and yearlings were, in the majority of cases, undersupplied with animal food, and sometimes changed over completely to phytoplankton and detritus. The latter comprised 82-99% of the food weight.-Copyright (c) 1978, Biological Abstracts, Inc. W79-00320

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION, Norsk Inst. for Vannforskning, Blindern. For primary bibliographic entry see Field 5A. W79-00321

A SIMPLE MODEL FOR SHALLOW LAKE EVAPORATION,
Royal Netherlands Meteorological Inst., De Bilt (Netherlands).
For primary bibliographic entry see Field 2D.
W79-00326

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN, Canada Centre for Inland Waters, Burlington

For primary bibliographic entry see Field 5A. W79-00339

LAKE LEVEL CONTROL AND MANAGE-MENT--A CASE STUDY, Barr Engineering Co., Minneapolis, MN. For primary bibliographic entry see Field 4A. W79-00390

OPTIMAL OPERATION OF SHELBYVILLE AND CARLYLE LAKES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 4A. W79-00392

ARCADIA LAKE WATER-QUALITY EVALUATION,

TION, Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. For primary bibliographic entry see Field 5C. W79-00463

HYDRAULICS OF GREAT LAKES INLETS, Coastal Engineering Research Center, Fort For primary bibliographic entry see Field 8B.

CONTROL OF WATER RESIDENCE TIME IN SMALL RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedimentation Lab.
For primary bibliographic entry see Field 4A.
W79-00482

INTERNAL FRONTS IN TWO-LAYER FLO, Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering; and Technische Hogeschool, Delft (Netherlands). Lab. of Fluid Mechanics. For primary bibliographic entry see Field 8B. W79-00486

RELATIONSHIP OF RAINFALL AND LAKE GROUNDWATER SEEPAGE, McGill Univ., Montreal (Quebec). Dept. of Biolo-For primary bibliographic entry see Field 5B. W79-00489

2I. Water In Plants

STOMATAL AND NONSTOMATAL REGULA-TION OF WATER USE IN COTTON, CORN AND SORGHUM, Texas Tech Univ., Lubbock. Dept. of Plant and Soil Science. Soil Science.
R. C. Ackerson, and D. R. Krieg.
Plant Physiology, Vol. 60: p 850-853, 1977. OWRT
C-6273(No 5225)(5), 14-31-0001-5225.

Descriptors: *Drought resistance, *Drought tolerance, Moisture availability. *Enzymes, *Moisture atress, *Photosysthesis, *Stomata, Osmotic pressure, Turgidity, Growth stages, *Corn(Field), *Cotton, *Sorghum.

Stomata of corn (Zea mays L.) and sorghum (Sorghum bicolor L.) responded to changes in leaf water potential during the vegetative growth phase. During reproductive growth, leaf resistances were minimal and stomata were no longer sensitive to bulk leaf water status even when leaf water potentials approached -27 bars. Stomata of corn, cotton (Gossypium hirsutum L.), and sorghum appear to respond to changes in the humidity deficit between the leaf and air and in this manner, regulated transpirational flux to some degree. Distinct differences in water transport efficiency were observed in the three species. Under nonlimiting soil water conditions, sorghum exhibited the greatest efficiency of water transport while under limiting soil moisture conditions, cotton appeared most efficient. Corn was the least efficient with respect to non-stomatal regulation of water use. Differences in drought tolerance among the three species are partially dependent on stomatal requisition of water use. but efficience of the three species are partially dependent on sto-matal regulation of water loss, but efficiency of the water transport system may be more related to drought adaptation. This is particularly important since stomata of all three species did not respond to bulk leaf water status during a large portion of the growing season. W79-00016

WATER RELATIONS AND PHYSIOLOGICAL ACTIVITY OF POTATOES,
Texas Tech Univ., Lubbock. Dept. of Plant and R. C. Ackerson, D. R. Krieg, T. D. Miller, and R. G. Stevens. Journal of the American Society for Horticultural Science, Vol. 102, No. 5 p 572-575, 1977 4 fig, 1 tab, 17 ref. OWRT C-6273(No 5225)(4).

Descriptors: *Drought resistance, *Drought tolerance, *Moisture availability, *Enzymes, *Moisture stress, *Photosynthesis, *Stomata, Turgidity, Growth stages, *Potatoes.

Field 2-WATER CYCLE

Group 21-Water In Plants

The effects of varying degrees of water stress on internal water potential components and specific physiological processes were investigated in field grown potatoes. Leaf water potential was not directly related to soil water potential until a specific minimum soil water potential until a specific minimum soil water potential did not increase in response to increases in soil water potential. The specific trends in plant water potentials are discussed in relation to the possible involvement of tubers in regulating water flux. Water stress had pronounced effects on physiological processes such as stomatal resistance, photosynthesis and possibly enzyme activity. A decline in leaf water potential was apparently responsible for increased stomatal resistance and decreases in photosynthetic rate. The activities of responsible for increased stomatal resistance and decreases in photosynthetic rate. The activities of ribulose di-phosphate carboxylase and phosphoenolpyruvate carboxylase were observed to decrease as leaf water potential declined. The realationship between water stress and physiological processes and the inability of leaf water potentials to respond to increases in soil water potential after a maximum stress may partially explain the extreme sensitivity of potatoes to even mild water

GROWTH ASPECTS OF GREEN ASH SEEDLINGS IN YEARS VARYING IN MOISTURE (IN RUSSIAN), Saratov Agricultural Inst. (USSR), A. I. Peretyatko, and N. I. Fedorov. Lesovedenie 4, p 75-79, 1975.

Descriptors: *Dry matter, Vegetation, Roots, *Green ash, *Growth rates, *Moisture, Seedlings.

Processes of dry matter accumulation in the whole Processes of dry matter accumulation in the whole plant and separate organs are rhythmical. The main part of dry mass accumulates in the 1st half of vegetation. Roots of the 1st order appear at the phase of the 1st pair of true leaves, the 2nd ones at the phase of 2 pairs, the 3rd at 5 pairs, the fourth at 11-13 pairs of leaves. The main part of the seedling root system consists of lateral roots 10-20 and 21-W79-00018

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, AN-NOTATED BIBLIOGRAPHY. For primary bibliographic entry see Field 10C. W79-00106

EFFECT OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF CADDIS FLY LAR-VAE IN SMALL RIVERS (IN RUSSIAN), Yaroslavskii Gosudarstvennyi Pedagogicheskii Inst. (USSR). E. F. Nikishina, L. A. Vetrova, T. L. Alekseeva,

and G. F. Golubeva. Ekologiya 5(5), p 40-43, 1974.

Descriptors: *Caddis-fly, Chaetopteryx-villosa, Cyrnus-flavidus, *Distribution, Economus-tenellus, Environmental, Goera-pilosa, Hydropsyche-pellucidula, *Larvae, Limnophilus-flavicornis, pellucidula, *Larvae, Limnophilus-ilavicorms, Mystrophora-intermedia, Orthotrichia-tetensii, Oxyethira-costalis, Phryganea-grandis, Phryganea-striata, Polycentropus-flavomaculatus, Rhyacophila-nubila, Rhyacophila-septentrionis, Rivers, Silo-pallipes, Soil, USSR.

The distribution of caddisfly larvae was studied in the Rivers Goretovka (Moscow Oblast), Solonitsa the Rivers Goretovka (Moscow Oblast), Solonitsa (Yaroslavi Oblast), and Kolodnyanka (Smolensk Oblast) (USSR), considering physical and geographic factors. The Goretovka River showed the following ecological groups: psychrophilic rheophilic (Rhyacophila septentrionis, Hydropsyche pellucidula), lithorheophilic (Polycentropus flavomaculatus, Silo pallipes, Goera pilosa, Chaetopteryx villosa), psammorheophilic (Phyganea striata, P. grandis) and pelite-rheophilic (Limophilus flavicornis). The Solonitsa River shows lithorheophilic Mystrophora intermedia, Ecnomus tennelus and L. flavicornis and phytophilic Oxyethira costalis, E. tennelus, Cyrnus flavidus and Orthotrichia tetensii. The weakly mineralized and hydrocarbonate, Kolodonyanka River showed 12 caddis fly species, of which H. pellucidula, Rhyacophila nubila, and S. pallipes were predominant. Although the Rivers Goretovka and Kolodnyanka belong to different basins, the caddisfly fauna in these 2 rivers was similar. This may be due to similar bottom soil, current speed, and similar chemical composition. The Solonitsa River belongs to the Volga basin, as does the Goretovka. However, the caddisfly fauna com-position is different in the 2 rivers. This is due to the unique chemical composition of the water and hydrologic system of the Solonitsa River. W79-00147

NITRATE REDUCTASE ACTIVITY OF SOYBEANS IN RELATION TO OTHER INDICA-TORS OF WATER STRESS, Kansas Water Resources Research Inst., Manhat-

R. Manam, I. D. Teare, W. L. Powers, and E. L.

Skidmore.
Phyton, Vol. 35, No. 2, p 189-194, 1977. 3 fig, 12 ref. OWRT A-060-KAN(2).

Descriptors: Irrigation, *Bioindicators, *Soybeans, Water stress, *Nitrate reductase, Irrigation scheduling.

In vivo nitrate reductase activity (NRA) was mor in vivo nitrate reductase activity (NKA) was moni-tored in soybeans (Glycine max L. Merr. cv. Cal-land) and compared to physiological age and to the following physical and physiological indicators of water status in plants and soil: leaf water potential (psi L), stomatal resistance (Rs adaxial), and soil water potential (psi s). NRA was high in vegetative stage, gradually reduced until bloom stage, and then fell rapidly during pod stage onward in non-stressed plants. In stressed plants NRA started falling rapidly early in bloom stage. NRA decreased rapidly when psi leaf decreased below 8 bars but adaxial stomata did not begin to close until psi leaf decreased below -16 bars. Leaf water potential is related to psi soil. NRA decreased when psi soil decreased below -2 bars and adaxial stomata began closing at -7 bars. From these results it is concluded that NRA responded to water stress very early in relation to stomatal resistance and was too sensitive to be used as a tool for irrigation scheduling. W79-00149

PROGRESS AND PROBLEMS IN THE STUDY OF PLANT-WATER INTERRELATIONS (IN BULGARIAN).

Fiziol Rast (Sofia) 2(4), p76-91. 1976.

Descriptors: *Soil-water-plant relationships, *Consumptive use, *Reviews, Model studies, Computer models, Transpiration, Stomata.

Very early studies and studies done at the beginning of the 20th century on plant-water in-teractions are briefly mentioned, followed by detailed review of more recent contributions in this area. These latter have included progress in the study of water stress measurement, water ab sorption, the cohesion theory, the concept of a soil-plant-atmosphere unity, modeling and com-puter simulation, transpiration and stomatal behavior and antitranspirants. Many interesting problems remain to be studied, including root function, resistance to water flow in plants and the soil, the effect of water deficit and drought resistance.--Copyright 1978, Biological Abstracts, W79-00187

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-- PARTS II - V, Florida Atlantic Univ., Boca Raton. Dept. of Biological Sciences. D. F. Austin, K. Coleman-Marois, and D. R.

Florida Scientist, Vol. 40, No. 4, p 331-361, Fall, 1977. 9 fig, 80 ref.

Descriptors: *Florida, *Vegetation, Drainage, Urbanization, Effects, Marshes, Mangroves, Wetlands, Hammocks.

II. Boca Raton Hammock, a tropical hammock on a barrier island, was originally bordered on the west by a freshwater sawgrass marsh which became overgrown by mangrove following drainage. Strand vegetation dominated by saw pai-metto has persisted for at least a century. III. Yamota Scrub has undergone few successional changes for the past century despite its near extir-pation because of agriculture and urbanization. IV. Butts Hammock is an inland hammock with 73% butts rammock is an instant naminota with representation of this area, all of the wet prairie formerly north of the hammock has disappeared; the majority of the swamps west of the hammock and all of the dry prairies are gone. Most of the hammock itself still remains. V. Boca Raton Inlet has mock itself still remains. V. Boca Ration Inlet has undergone several changes in physiography and vegetation in the past with three major changes in the last 100 years. Increased salinity has resulted in the spread of mangroves, and disturbance has resulted in the establishment of exotic plant species. (Stihler-Mass) W79-00196

CATTAILS (TYPHA SPP.)--WEED PROBLEM OR POTENTIAL CROP., Miami Univ., Coral Gables, FL.

J. F. Morton. Economic Botany, Vol. 29, No. 1, p 7-29, January-March, 1975. 10 fig, 158 ref.

Descriptors: *Cattails, *Aquatic weeds, *Reviews, Value, *Utilization, Rooted aquatic plants, Foods, Feeds, Construction materials, Wildlife, Pollen, Leaves, Seeds, Oilseed crops, Toxicity, Floss

Cattails, which are subject to vigorous control measures in many parts of the world, deserve study with respect to industrial utilization as an alternative to destruction. Various uses of cattails reported in the literature are reviewed. Cattail nds provide food and cover for wildlife. They have been cultivated as ornamental plants and to control erosion. As a construction material, cattail stems and leaves have been used to make various objects ranging from sandals to sailboats; the cuticle of the stem has been used for weaving; sheaths cut in the fall have been used to caulk barrels. Fibers can be extracted from leaves and stems. Fibers can be extracted from leaves and stems. Cattail leaves and stems are suitable for paper-making producing a paper which is rather strong but difficult to bleach. Cattail floss has a wide array of uses including stuffing for cushions and use as an insulating and sound-proofing material. The heart of young plants, rootstocks, rootstock sprouts, flower spikes, pollen and seeds have been used as human and animal foods. Various parts of the plant have been used for medicinal curposes. the plant have been used for medicinal purposes. Cattail seeds yield a drying oil. Cattails have, on various occasions, been reported as toxic to hu-mans and animals. (Stihler-Mass) W79-00198

EFFECT OF SULFUR DEFICIENCY ON WATER REGIME AND INTENSITY OF PEA AND WHEAT PHOTOSYNTHESIS, (IN RUS-

Krasnoyarsk State Univ. (USSR). A. N. Bugakova, E. A. Petrishcheva, and T. E. Il'Yuschchenko. Fiziol Biokhim K ul't Past 7(5), p 513-516, 1975.

Erosion and Sedimentation—Group 2J

Descriptors: Droughts, *Pea, *Photosynthesis, Resistance, *Sulfur, *Wheat, Plant growth.

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In plants with S deficiency the share of free water increases, the water-holding capacity decreases and a 10-20% decrease in the tissue water content results in a stronger depression of photosynthesis as compared with the plants provided with a higher amount of sulfates. It might be possible to increase the plant drought-resistance by increasing the S supply. Copyright 1976, Biological Abstracts, Inc. W79-00200

THE PRODUCTIVITY OF A RANGE OF BLANKET BOG VEGETATION TYPES IN THE NORTHERN PENNINES, Nature Conservancy, Alston (England). Moore House Field Station. G.I. Forrest, and R. A. H. Smith. Journal of Ecology, Vol. 63, No. 1, p 173-202, March, 1975. 9 fig, 13 tab, 16 ref, 1 append.

Descriptors: *Productivity, *Vegetation, *Bog, Seasonal, Period of growth, Mosses, Wetlands, Calluna, Eriophorum, Floriste composition, Northern Pennines.

Total and component net production of seven blanket bog sites in the Moor House National Nature Reserve in the northern Pennines, representing a range of variation in floristic composition, was estimated. There was a two-fold variation in production between sites (481-868 g/sq m/yr), the mean total annual net production for all seven sites studied being 659 + or - 53 g/sq m/yr. Between-year variation was relatively small in comparison to that between sites—this determined by obtaining limited data from one site over a three-year period limited data from one site over a three-year period to that between sites—this determined by obtaining limited data from one site over a three-year period. The sites with the highest production were those which had been recently burnt. For the remaining sites, assumed to be in a steady state situation, there was a trend of decreasing production with increasing wetness, reflecting decreasing contribution of Calluna and Eriophorum vaginatum only partly replaced by increased Sphagnum growth on the wette sites. Mean production per growing season day for the four Calluneto-Eriophoretum sites was 1.98 g m-2 day-1. The total production of the 1215 ha of blanket bog within the Reserve was estimated as 7.67 x 10 to the 6th power kg/yr-1. (Maroncelli-Mass)

WET MEADOWS IN SOUTHERN SWEDEN: VEGETATION, SUCCESSION AND MANAGE-MENT (IN SWEDISH), Lund Univ. (Sweden). Dept. of Ecological Botany.

A. Larsson. Medd Avd Ekol Bot Lunds Univ (31), p 1-107,

Descriptors: *Sweden, *Meadows, Lake shores, *Vegetation, Flooding, Water table fluctuation, Carex-Acuta, Cattle, Deschampsia-Caespitosa, Ecology, Filipendula-Ulmaria, Fire, Floristics, Grass, Grazing, Hay, Herbs, History, Literature, Soils, Waterfowl.

Wet meadows frequently occur along riversides and lake shores in southern Sweden. They are influenced by a high water table or periodic floodings. Physiognomically they are dominated by tall species such as Deschampsia caespitosa, Carex acuta or Filipendula ulmaria, though small herbs and grasses are also important components of the vegetation. The general character of the wet meadow varies with soil, water regime and the influence of man and cattle, providing different types of habitats for waterfowl. The floristic delimitation of these meadows is discussed and a short account of the historical development is given. The literature is surveyed. The floristic composition of the wet-meadow vegetation is summarized and ecological species groups are distinguished using vegetation analyses. The ecological effects of management (hay-making, grazing, fire)

are briefly discussed. Suggestions for the restora-tion and management of wet meadows are given.— Copyright 1978, Biological Abstracts, Inc. W79-00288

THE PHOSPHAGENS OF SOME PROTOZOA AS ECOLOGICAL INDICATORS (IN FRENCH), Cagliari Univ. (Italy). Faculty of Medicine. For primary bibliographic entry see Field 5A. W79-00423

2J. Erosion and Sedimentation

MECHANICAL CHARACTERISTICS OF DEBRIS FLOW, Kyoto Univ. (Japan). Disaster Prevention Research Inst. T. Takahashi.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY8, Proceedings Paper 13971, p 1153-1169, August 1978. 12 fig, 9 ref.

Descriptors: "Bed load, "Bores, "Sediments, Fluid mechanics, Velocity, Hydraulics, Sediment transport, Overland flow, Profiles, "Debris flow, Nonstationary bed flow.

A mechanism of occurrence of bore-like debris flow due to the appearance of overland flow on the debris accumulation was considered using the ap-plying shear stress and resisting stress relationship in the bed. The criteria for the occurrence of the nonstationary bed flow and the partly stationary bed flow were made clear. The partly stationary bed flow approaches a quasi-steady state, whose depth, velocity and concentration are predictive applying the concept of dilatant fluid introduced by Bagnold. Although the front height of the nonstationary bed flow increases versus distance, the translation velocity and concentration are nearly constant, and flow characteristics are theoretically predictive by some appropriate assumptions. (Lee-ISWS) W79-00117

SCOUR OF BED MATERIAL IN VERY ROUGH

CHANNELS, Technical Univ. of Istanbul (Turkey). Dept. of Hydralic and Water Power. M. Bayazit.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Technical Note, p 1345-1349, September 1978. 3 fig, 2 ref, 1 append.

Descriptors: *Scour, *Laboratory tests, *Bed load, Sediment transport, Channels, Running waters, Movement, Roughness(Hydraulic), Analytical techniques, Analysis, Equations, Rough channels.

Experiments with densely packed uniform spheres have confirmed that the initiation of motion of bed material is affected by the relative roughness of the channel. At shallow depths, larger values of the Shields' parameter are required to initiate the motion. This was explained by the reduction of nondimensional velocities, u/u sub *((velocity of flow in vicinity of particle)/(bed shear velocity)), at the bed level with the increase of d/h((characteristic particle size)/(flow depth)). The effective value of the instantaneous flow velocity is achieved at higher bed shear stresses in comparison with flows at mild slopes. (Humphreys-ISWS)
W79-00122 W79-00122

MEASUREMENTS OF BED LOAD IN OSCILLA-

TORY FLOW, Cambridge Univ. (England). Dept. of Engineering. J. F. A. Sleath.

Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 13960, p 291-307, August 1978. 11 fig, 1 tab, 18 ref, 2 ap-

Descriptors: *Bed load, *Sediment transport, *Laboratory tests, *Flow, Sedimentation, Analytical techniques, Measurement, Laboratory equipment, Hydraulic models, Movement, Currents(Water), Waves(Water), Beaches, Shore protection, Hydrodynamics, Erosion, Coastal engineering, Testing, Methodology, Oscillatory flow.

Measurements have been made of the quantities of sediment moving as bed load in oscillatory flow over a flat bed. Most of the measurements were made with an oscillating tray in still water, but some were carried out in a wave flume. There was good agreement between the two sets of results. good agreement between the two sets of results. For sand and gravel, the mean sediment transport rate was observed to vary during the course of the cycle like the fourth power of the velocity of oscillation, but with a slight phase lead. For nylon pellets, however, made of the random fluctuations in transport rate, and these were compared with AbouSeida's theoretical model. The agreement was poor for the beds of sand and gravel but reasonable for the nylon pellets. An empirical relationship was derived for the sediment transport rate. (Humphreys-ISWS) W79-00141

THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL,

Michigan Univ., Ann Arbor. Sea Grant Program. For primary bibliographic entry see Field 5B.

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY, Geological Survey, Menlo Park, CA. Water Resources Div. For primary bibliographic entry see Field 5B. W79-00271

NUMERICAL STUDY OF CONTINUOUS SAL-

NUMERICAL STODY OF CONTINUOUS SAL-TATION, New South Wales Univ., Kensington (Australia). School of Mechanical and Industrial Engineering. For primary bibliographic entry see Field 8B. W79-00314

BEDFORMS AND THEIR HYDRAULIC STA-BILITY RELATIONSHIPS IN A TIDAL EN-VIRONMENT, BAY OF FUNDY, CANADA, Oxford Univ., (England). Dept. of Geology and Mineralogy.
For primary bibliographic entry see Field 2L.
W79-00336

METHODICAL PROBLEMS IN THE EVALUA-TION AND MAPPING OF EROSION-ENDAN-GERED LANDS (IN RUSSIAN), Moscow State Univ. (USSR). Research Lab. of

Soil Erosion. M. N. Zaslavskii.

Pochvovedenie (6), p 85-98, 1977.

Descriptors: *Methodology, *Mapping, *Erosion, *Soil erosion, Evaluation, Equations, Fallow fields, *Wischmeier-Smith equation.

Methodical problems in evaluation and mapping of erosion-hazardous lands and the reasons for the use of the Wischmeier-Smith equation are discussed. Methods of using a part of this equation for calculation of possible soil erosion in fallowed fields are described.—Copyright 1978, Biological Abstracts, Inc. W79-00462

Field 2-WATER CYCLE

Group 2J-Erosion and Sedimentation

ORIGIN AND TRANSPORT OF LARGE BOUL-DERS IN MOUNTAIN STREAMS, Ministry of Works and Development Christchurch (New Zealand). Water and Soil Research.

G. A. Griffiths

Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 1-6, 1977, 1 fig. 12 ref.

Descriptors: *Streams, *Mountains, *Boulders, Movement, Scour, Erosion, Rocks, Streamflow, Loads(Forces), Model studies, Mathematical models, Hydrology, Mountain streams, Boulder

The means by which boulders of the order of meters in diameter appear in mountain stream beds was reviewed briefly. It was asserted that downstream translation under the action of direct fluid stress is unlikely. However, a combination of fluid stress and localized scour may effect small near-vertical displacements. Undermining of the stream bank upon which a boulder is perched has the potential to precipitate translation movements several diameters in extent, but the frequency of such incidents is probably not commensurate with the boulder's endurance to size reduction. Therefore, it was supposed that, as a rule, the net translation achieved by a large boulder during a streambed history of ordinary flood events can be measured in tens of meters. Where larger translations are in evidence, this may indicate that catastrophic events, such as natural dam breaks or in-channel debris flows, have occurred. (Sims-ISWS W79-00490

DETERMINATION OF SPOIL-BANK EROSION RATES IN OHIO BY USING INTERBANK SEDI-MENT ACCUMULATIONS, Ohio State Univ., Columbus. Dept. of Geology

and Mineralogy.
G. D. McKenzie, and J. R. J. Studlick

Geology, Vol 6, p 499-502, August 1978. 4 fig, 3

Descriptors: *Spoil banks, *Erosion rates, *Ohio, Sedimentation rates, Weathering, Leaching, Pollutants, Strip mine wastes, Slopes, Vegetation effects, Interbank accumulation, Universal soil-loss equation

Denudation rates of unvegetated spoil banks in Gallia County, Ohio, were determined using sedi-ment volumes and specific weights in 4 small interbank basins. Calculated rates are higher than those reported from other strip-mined areas because the spoil is unvegetated and consists mainly of friable sandstone. Spoil-bank slopes had erosion rates of 35,000 to 71,000 tons/sq km/yr (metric tons per square km per year) with an equivalent surface degradation of 2.6 to 5.4 cm/yr (cm per year). These rates show good correlation with mean slope length, which ranged from 5.8 to 12.8 m. Rates may be higher than calculated owing to loss of material by chemical weathering and subsequent leaching. The study demonstrated the suitability of simple measurements in interbank depressions to obtain average annual erosion rates for drastically disturbed landscapes. (Visocky-W79-00495

2K. Chemical Processes

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,

Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A.

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS, Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 5B.

REMOTE WATER MONITORING SYSTEM. National Aeronautics and Space Administration, Washington, DC. (Assignee). For primary bibliographic entry see Field 7B. W79-00047

TRANSFER OF GASES AT NATURAL AIR-WATER INTERFACES. Pennsylvania State Univ., University Park. Center for Air Environment Studies. For primary bibliographic entry see Field 2L. W79-00127

ASBESTOS - A BIBLIOGRAPHY, Environmental Research Lab.-Duluth, MN For primary bibliographic entry see Field 5A. W79-00225

YELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969. Environmental Protection Agency, Kansas City, MO. Region VII. ary bibliographic entry see Field 5A. For primar W79-00250

GROUNDWATER QUALITY ATLAS OF

Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln.
For primary bibliographic entry see Field 7C.
W79-00252

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI, Geological Survey, Rollo, MO. Water Resources

For primary bibliographic entry see Field 5B. W79-00254

AUTOMATED DETERMINATION OF SELENI-UM IN WATER. Geological Survey, Denver, CO. Water Resources For primary bibliographic entry see Field 5A. W79-00261

A LYSIMETRIC STUDY OF WATERS IN AN IR-RIGATED PASTURE (IN RUSSIAN), Moskovskaya Sel'skokhozyaistvennaya Akademiya (USSR). Div. of Meadow Science. For primary bibliographic entry see Field 2G. W79-00284

MANUAL OF ANALYTICAL QUALITY CONTROL FOR PESTICIDES AND RELATED COM-POUNDS IN HUMAN AND ENVIRONMENTAL Lafayette Coll., Easton, PA. Dept. of Chemistry. For primary bibliographic entry see Field 5A. W79-00287

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUS-SPRINGS,

Australian Atomic Energy Commission, Lucas Heights, New South Wales (Australia). Isotope

For primary bibliographic entry see Field 2F. W79-00322

HYDROGEOCHEMISTRY OF A CALCRETE-CONTAINING AQUIFER NEAR LAKE WAY, WESTERN AUSTRALIA, Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of Mineralogy. For primary bibliographic entry see Field 2F. W79-00323

FORMATION OF A VERMICULITE MINERAL FROM GROUND WATER COMPONENTS (IN RUSSIAN),
Akademiya Nauk SSSR, Pushchino. Inst. of Agrochemistry and Soil Sciences.
V. A. Kovda, and A. I. Trubin. Pochvovedenie (6), p 99-105, 1977.

Descriptors: *Groundwater, *Silicates, Mineralogy, X-ray diffraction, *Vermiculite, Vermiculite formation.

A possibility of vermiculite formation from components of ground water at normal temperature was shown. X-ray diffraction characteristics are presented of the newly-formed mineral.—Copyright 1978, Biological Abstracts, Inc. W79-00382

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES. PART IV. SULFATE DETERMINATION USING PB(2+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS, WEASUREMENT METHODS, Valmet Oy, Jyvaskyla (Finland). For primary bibliographic entry see Field 5A. W79-00429

CHLOROFLUOROCARBONS AS HYDROLOG-IC TRACERS A NEW TECHNOLOGY, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 5A.
W79-00461

DENITRIFYING BACTERIA CAN BE ENU-MERATED IN NITRITE BROTH, Connecticut Agricultural Experiment Station, For primary bibliographic entry see Field 2G. W79-00498

2L. Estuaries

SIMPLE VENTURI DEVICE FOR MIXING FRESHWATER AND SEAWATER IN AN ESTUARINE CULTURE SYSTEM, National Marine Fisheries Service, Auke Bay, AK. Auke Bay Fisheries Lab. For primary bibliographic entry see Field 7B. W79-00071

STUDY OF THE FISHES OF THE LAGOON OF ALVARADO, VERACRUZ. MEXICO

SPANISH),
Universidad Nacional Autonoma de Mexico, Mexico City. Inst. di Biologia.
A. Resendez Medina. Rev Soc Mex Hist Nat 34, p 183-281, 1973.

Descriptors: *Lagoon of

Alvarado(Mex). *Dissolved oxygen, *Fishes, Flooding, Freshwater, *Lagoons, *Mexico, Seasonal, Temperature, Veracruz.

Alvarado is a typical coastal lagoon, about 27 km long and 5 km wide, located in the southeastern part of the state of Veracruz, Mexico. It is connected to the Gulf of Mexico by the Papaloapan River. The lagoon is flooded with freshwater during the rainy season, and significant hydrological differences are observed between rainy and dry

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bout 27 km outheastern o. It is con-Papaloapan hwater durhydrological iny and dry seasons. The surface-bottom chlorinity gradient averaged 8.0% in April, 1966; 0.9% was recorded in July. Surface-bottom dissolved O2 values from 2.6 ml/l in May to 7.6 ml/l in August. Surface water temperature ranged from 34.0°C in May-18.1°C in Feb. Meristic and morphometric data are provided on 311 fishes, representing 60 spp. in 29 families, collected in Laguna de Alvarado. The majority are estuarine forms present throughout the year but some marine and freshwater species are also represented. The latter, normally confined to streams and rivers of the drainage basin, enter the Laguna in some numbers during the rainy season. Laguna in some numbers during the rainy season. The collection includes 56% of the species which are commercially important or locally utilized for food. W79-00079

TRANSFER OF GASES AT NATURAL AIR-WATER INTERFACES, Pennsylvania State Univ., University Park. Center for Air Environment Studies W. J. Brtko, and R. L. Kabel.

Journal of Physical Oceanography, Vol. 8, No. 4, p 543-556, July 1978. 12 fig. 43 ref. EPA R005168.

Descriptors: *Gases, *Air-water interfaces, *Mass transfer, *Model studies, Mathematical models, Atmosphere, Sea water, Oceans, Eddies, Laboratory tests, Carbon dioxide, Air, Oceanography, Gases exchange.

The natural exchange of gases across an air-water interface is an important mechanism that can be quantified. The mass-transfer coefficients characterizing the liquid phase can be predicted using certain models representing the liquid phase turbulence. Methods were developed to approximate the necessary input parameters. Predictions of the models yielded liquid-phase mass-transfer coefficients well within an order of magnitude of experimental data at air-water interfaces. (Sims-ISWS) mental data at air-water interfaces. (Sims-ISWS) W79-00127

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART I: ONE-DIMENSIONAL GRAVITY WAVE MO-TION, National Oceanic and Atmospheric Administra-

National Oceanographic and Atmospheric Labs.
W. C. Thacker.
Journal of Physical Oceanography, Vol. 8, No. 4, p. 676-679, July 1978. 3 fig, 2 tab, 3 ref.

Descriptors: *Mathematical models, *Model studies, *Finite element analysis, *Gravity waves, Water circulation, Equations, Analytical techniques, Seiches, Lakes, Canals, Bays, Mathematics, Limnology, Oceanography, *Finite dif-fernce analysis.

The finite-element scheme requires more computational expense because it is time-implicit and because it requires a smaller time step than the mode oscillations revealed that for cases where the basin depth and the numerical grid are uniform, the finite-difference scheme is more ac curate, but for cases where the depth or the grid varies, the finite-element scheme is more accurate. (See also W79-00130) (Sims-ISWS) W79-00129

COMPARISON OF FINITE-ELEMENT AND FINITE-DIFFERENCE SCHEMES. PART II: TWO-DIMENSIONAL GRAVITY WAVE MO-

TION, National Oceanic and Atmospheric Administra-tion, Miami, FL. Atlantic Oceanographic and At-mospheric Labs. W. C. Thacker.

Journal of Physical Oceanography, Vol. 8, No. 4, p 680-689, July 1978. 8 fig. 1 tab, 7 ref., 2 append.

Descriptors: *Mathematical models, *Model studies, *Finite element analysis, *Gravity waves, Water circulation, Equations, Analytical techniques, Mathematics, Bays, Estuaries, Shores, Circulation, Oceanography, Limnology, *Finite difference analysis.

Irregular grid finite-difference techniques lead to arregular grid inthe-difference techniques lead to equations similar to those obtained using finite-element techniques. The simpler finite-difference equations offer the advantage of greater computa-tional economy. The time-implicit, finite-element equations must be inverted at each time step, and the maximum size of the time step is only half that which can be used with the finite-difference equa-tions. Both techniques result in instabilities when tions. Both techniques result in instabilities when used with highly irregular grids, and the finite-element equations are also unstable if the basin is variable. Although the finite-element results are better when compared with finite-difference results from the same grid, comparable finite-difference results can be obtained using a finer grid at less computational expense. (See also W79-00129) (Sims-ISWS)
W79-00130

ON GEOSTROPHIC ADJUSTMENT IN SEA STRAITS AND WIDE ESTUARIES. PART I: ONE-LAYER SYSTEM,

Wisconsin Univ.-Madison. Dept. of Meteorology. D. Nof.

Dournal of Physical Oceanography, Vol. 8, No. 4, p 690-702, July 1978. 8 fig, 17 ref, 1 append. NOAA 04-3-158-61.

Descriptors: *Discharge(Water), *Estuaries, *Straits, *Model studies, Mathematical models, Descriptors: Laboratory tests, Flow, Currents(Water), Water circulation, Coriolis force, Channel flow, Coasts, Tidal waters, Oceans, Oceanography.

The dynamics of outflows from sea straits and wide estuaries were examined through a simplified frictionless model whose primary motions are not constrained to be quasi-geostrophic. The potential vorticity equation was solved by means of approximate analytical methods. Some of the model pre-dictions were tested in the laboratory. The mathematical model predicts that an outflow from a channel with uniform velocity distribution deflects to the right or left, depending on the depth of the basin into which it debouches. There is a 'critical' Rossby number below which the flow separates from one of the basin banks. When a non-uniform velocity is introduced upstream, the direction of deflection may differ substantially from the up-stream uniform flow case. The model showed that rotation is important whenever the ratio between the relative depth variation to the Rossby number is not negligible; rotational effects can be important even if the ratio between the channel width and the Rossby deformation radius is entirely negligible. An experimental system consisting of a rotating channel with an abrupt cross sectional variation was used in the laboratory to test the theory. Deflections resulting from 'supercritical' conditions were tested qualitatively with favorable results. (Sims-ISWS) W79-00131

INERTIAL CURRENTS OVER THE INNER SHELF NEAR 30 DEGREE N, Louisiana State Univ., Baton Rouge, Coastal Stu-

dies Inst. Journal of Physical Oceanography, Vol. 8, No. 4, p 728-733, July 1978. 3 fig, 21 ref.

*Currents(Water), *Coasts, **Continental shelf, **Louisiana, *Gulf of Mexico, Model studies, Mathematical models, On-site in-vestigations, Current meters, Tidal waters, Shal-

low water, Winds, Circulation, Water circulation, Oceanography, Inertial currents, Inner shelf.

Analysis of two month-long current records, one in February and one in May, from the inner shelf (28.9 deg N) west of the Mississippi River delta showed strong oscillations in the diurnal-inertial frequency band. Lack of correlation of these currents with the predicted or measured tide and stron association with frontal passages suggest that they are wind-induced inertial oscillations. The observed oscillations were well associated by served oscillations were well reproduced by a time-dependent wind-driven model, including Coriolis acceleration and friction. (Sims-ISWS) W79-00133

MEASUREMENTS OF BED LOAD IN OSCILLA-

TORY FLOW, Cambridge Univ. (England). Dept. of Engineering. For primary bibliographic entry see Field 2J. W79-00141

VEGETATION OF SOUTHEASTERN FLORIDA

PARTS II - V,
Florida Atlantic Univ., Boca Raton. Dept. of
Biological Sciences. For primary bibliographic entry see Field 21. W79-00196

WETLANDS AS A NAVAL ENVIRONMENTAL

Naval Academy, Annapolis, MD. Dept. of Political Science.

For primary bibliographic entry see Field 6G. W79-00201

W79-00204

THE PHOTOSYNTHETIC AND RESPIRATORY RATES AND TOLERANCES OF BENTHIC ALGAE FROM A MANGROVE AND SALT MARSH ESTUARY: A COMPARATIVE STUDY, University of South Florida, Tampa. Dept. of Biology.
For primary bibliographic entry see Field 5C.

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER DIATOMS,

Cologne Univ. (Germany, F.R.) Botanisches Inst. For primary bibliographic entry see Field 5C. W79-00208

DIEL CYCLES OF INORGANIC NITROGEN UPTAKE IN A NATURAL PHYTOPLANKTON POPULATION DOMINATED BY GONYAULAX POLYEDRA, Bigelow Lab. for Ocean Sciences, West Boothbay

For primary bibliographic entry see Field 5C. W79-00210

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UP-

TAKE, New York State Dept. of Health, Albany. En-vironmental Health Center. For primary bibliographic entry see Field 5C.

GROWTH, MORTALITY, AND BIOMASS PARTITIONING IN FRESHWATER TIDAL WETLAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA), Rider Coll., Trenton, NJ. Dept. of Biology. For primary bibliographic entry see Field 5C. W79-00214

THE VERTICAL PLANAR MOTION MECHANISM; A DYNAMIC TEST APPARATUS FOR EVALUATING CURRENT METERS AND OTHER MARINE INSTRUMENTATION, National Ocean Survey, Rockville, MD.

Field 2-WATER CYCLE

Group 2L—Estuaries

For primary bibliographic entry see Field 7B. W79-00224

CONTINUOUS CULTURE DIATOMS UNDER SILICON LIMITATION. 3. A MODEL OF SI-LIMITED DIATOM GROWTH. Washington Univ., Seattle. Dept. of Oceanog-

raphy.
For primary bibliographic entry see Field 5C.
W79-00229

FIRST ECOLOGICAL DATA ON THE OYSTER PONDS IN THE BAY OF BOURGNEUF (IN

FRENCH), Institut des Sciences de la Nature, Nantes (France). Lab. d'Ecologie Animale et Biologie I M Robert

Bull Ecol 8(1), p 57-62, 1977.

Descriptors: Bays, *Bay of Bourgneuf(Fr), Hydrogen ion concentration, *Oyster ponds, Ecology, *Oysters, *Diatoms, France, Navicula-ostrearia, *Salinity, *Temperature.

In Bourgneuf bay (France), oysters are immersed in sea basins called oyster ponds, where prolifera-tion of the diatom Navicula ostrearia Bory at the blue pigmented stage leads to the greening. Three ecological factors in a pond (temperature, salinity, pH) were studied together with climatic factors of temperature and rain. The relative isolation of this environment explained diurnal and seasonal fluctuations of the 3 studied factors. A defined diurnal thermic amplitude preceded and signalled the greeing phase of the basin; during this period, pH increased and oscillated at about 8.2 .- Copyright 1978, Biological Abstracts, Inc. W79-00295

ANNUAL SUBSURFACE TRANSPORT OF A RED TIDE DINOFLAGELLATE TO ITS BLOOM AREA: WATER CIRCULATION PATTERNS
AND ORGANISM DISTRIBUTIONS IN THE
CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, MD. McCollumPratt Inst.; and Johns Hopkins Univ., Baltimore,
MD. Dept. of Biology.

For primary bibliographic entry see Field 5C. W79-00317

OPTICAL CLASSIFICATION OF NATURAL

Scripps Institution of Oceanography, San Diego, CA. Visibility Lab.

R. C. Smith, and K. S. Baker

Limnology and Oceanography, Vol. 23, No. 2, p 260-267, March 1978. 6 fig, 1 tab, 28 ref. NOAA 04-6-158-44033

Descriptors: *Optical properties, *Sea water, Oceans, *Classification, Organic matter, Chlorophyll, Phytoplankton, Remote sensing, Light, Light penetration, Attenuation, Color, Oceanography, Marine biology.

A technique was developed that leads to an optical classification of natural waters in terms of the dissolved and suspended biogenous material present. As a first approximation, this classification was made in terms of the total chlorophyll-like pigment concentration. A relationship between the spectral diffuse attenuation coefficient for irradiance and the chlorophyll-like pigment concentration was found with spectral irradiance data for diverse types of ocean waters. The specific spectral attenuation coefficient due to phytoplankton was shown to be consistent with laboratory measurements of the diffuse absorption coefficient of various lot cultures of phytoplankton. (Sims-ISWS)

SEVEN PROBLEMS IN BUBBLE AND JET DROP RESEARCHERS.

State Univ. of New York at Albany. Atmospheric Sciences Research Center. For primary bibliographic entry see Field 8B. W79-00319

REGIONAL RESPONSE TO FORCING IN SOUTHERN STRAIT OF GEORGIA, National Oceanic and Atmospheric Administra-tion, Seattle, WA. Pacific Marine Environmental

J. D. Schumacher, C-A. Pearson, R. L. Charnell,

Estuarine and Coastal Marine Science, Vol. 7, No. 1, p 79-91, July 1978. 10 fig, 1 tab, 14 ref.

Descriptors: *Straits, *Currents(Water), *Tidal effects, *Water circulation, *Canada, Estuaries, Onsite investigations, Velocity, Current meters, Onsite data collections, Data collections, Surveys, Tidal waters, Water temperature, Winds, Hydrography, Salinity, Convection, *British Columbia, *Strait of Georgia(Canada), Two layered flow.

Current meter, STD, and wind data presented to describe late winter (February-April) mean circulation in the southern Strait of Georgia The circulation scheme was dominated by strong outward (southeast) flow on the western side of the strait. On the eastern side there was a weaker northwest flow. Mean speeds within a 95% confidence interval from near-surface (5 m) current records were observed to be 16 + or - 7 cm/s toward the south-southeast in the center of the strait, 26 + or - 5 cm/s toward south-southeast in Boundary Pass, and 3.7 + or - 2.5 cm/s toward the northwest on the eastern side. Oceanic waters enter the region at depth through Haro Strait in response to Fraser River runoff at the surface. Superposition on this flow of strong tidal current signal results in augmentation of the flood on the eastern side of the ebb on the western side; however, there is no net tidal northward flow through Rosario Strait. The wind field during this experi-ment was generally uniform throughout the region. Although winds were uniform, response was not. The deep waters on the western side have relativeresponse to wind, and gravitational con vection is the dominant driving mechanism. On the shallow eastern side, wind was concluded to be the dominant mechanism driving mean circulation. (Humphreys-ISWS) W79-00324

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS, Harbor Branch Foundation, Inc., Fort Pierce, FL.

For primary bibliographic entry see Field 5A. W79-00325

BEDFORMS AND THEIR HYDRAULIC STA-BILITY RELATIONSHIPS IN A TIDAL EN-VIRONMENT, BAY OF FUNDY, CANADA, Oxford Univ., (England). Dept. of Geology and

Mineralogy.
R. W. Dalrymple, R. J. Knight, and J. J. Lambiase.
Nature, Vol. 275, No. 5676, p 100-104, September 14, 1978. 4 fig, 2 tab, 35 ref.

Descriptors: "Beds, "Beds under water, *Estuaries, "Canada, Bays, Tidal waters, Tides, Channel morphology, Geomorphology, Sands, Sand waves, Sand bars, Sediments, Erosion, Deposition(Sediments), Particle size, Hydraulics, Water circulation, "Bay of Fundy(Canada), Bedform.

Three intermediate- to large-scale bed configurations were recognized (from intertidal sand bodies in the Bay of Fundy), each with a discrete hydraulic stability field. Type 1 megaripples ('bars') form at lower flow felocities than Type 2 megaripples ('dunes'), whereas Type 2 megaripples and

megarippled sandwaves are separated primarily by grain size. Megarippled sandwaves occur sands coarser than 0.308 mm. (Sims-ISWS) W79-00336

VEGETATIVE STABILIZATION OF DREDGE SPOIL IN NORTH FLORIDA, Florida A and M U niv., Tallahassee. For primary bibliographic entry see Field 5G. W79-00337

CHANGES IN INTERSTITIAL WATER SALINI-TY OF A MISSISSIPPI TIDAL MARSH, Mississippi State Univ., Mississippi State. Dept. of

Zoology. C. T. Hackney, and A. A. De La Cruz. Estuaries, Vol. 1, No. 3, p 185-188, September 1978. 1 fig, 2 tab, 22 ref. NSF GA-35715.

Descriptors: *Connate water, *Tidal marshes, *Mississippi, *On-site investigations, Water quality, Marshes, Salinity, Saline water, Marsh plants, Data collections, On-site data collections, Hydrogen ion concentration, Bays, Surface waters, Juneus roemerianus, Spartina cynosuroides.

The salinity of interstitial water (i.e., the salinity of the free soil water) was examined at 11 equidistant stations along a transect on a Mississippi tidal marsh dominated by Juncus roemerianus and Spartina cynosuroides. Changes in the nearby sur-Sparting cynosuroises. Changes in the nearby sur-face water (e.g., bay water) were reflected in the changes in interstitial water salinity. The salinity of interstitial water was usually higher, varying between 2.5 and 15.8 parts per thousand from February 1975 through January 1976, than the salinity of the nearby surface water which ranged from 0.0 to 11.5 parts per thousand. Following a long period of high salinity in the bay and sound (exceeding 14 parts per thousand), the salinity of the interstitial water increased to a maximum of 16.8 parts per thousand in October. The salinity increased as the distance of the sampling station from the source of the flood water increased. Mean interstitial water salinity across the marsh studied was within 10 parts per thousand, which did not seem to influence the marsh plant zonation occurring on the marsh. (Humphreys-ISWS) W79-00338

A STUDY OF COASTAL POLLUTION AND AGENCY INTERFACE, University of Southern Mississippi, Hattiesburg. Coll. of Business Administration. For primary bibliographic entry see Field 5G. W79-00389

THE EFFECT OF REDUCED WETLANDS AND STORAGE BASINS ON THE SIZE, STABILITY AND PRODUCTIVITY OF THE WATERSHED

MIXING ZONE, Connecticut Univ., Storrs. Inst. of Water B. L. Welsh

Available from the National Technical Informarion Service, Springfield, VA 22161 as PB-288 222, Price codes: A03 in paper copy, A01 in microfiche. Research Project Technical Completion Report, 1978. 43 p. 9 tab, 18 fig. 22 ref. OWRT A-064-CONN(1). 14-31-0001-5007.

Descriptors: *Estuaries, Management, Urbaniza-tion, Watershed management, *Salinity structure, Benthic productivity, Stability watershed systems, *Mixing zones, Freshwater flow, Reduced wel-lands/storage basins, *Connecticut.

Three watershed systems in southeastern Connecticut were compared to determine whether changes in their wetlands and storage basins could have resulted in an expansion of the estuarine mixing zone with subsequent losses in benthic productivity. In Alewife and Jordan Cove systems, drastic storms fully h zone, water) three n two, be course its esti estuari to hav domina tually I structu

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drastic changes in salinity structure following rainstorms caused the mixing zone to oscillate over fully half the total area of the estuary. Beneath this zone, flocculent silt-clay sediments (80%-85% water) covered the bottom in a layer exceeding three m in some places. It had been expected that the Alewife system would be the less stable of the two, because urban development has destroyed or functionally separated 50% of its former water-courses and inland wetlands and 40% and 75% of its estuarine basins and marshes. It now appears that both estuaries have exceeded critical balances, which may be a characteristic of small estuaries. The Alewife system however, appears to have advanced further on the road to tidal dominance. Its lower reaches are filling rapidly with marine sediments and its mixing zone may acdominance. Its lower reaches are filling rapidly with marine sediments and its mixing zone may actually be on the decline. In Goshen Cove, salinity structure was very stable following rainstorms, but the area of soft sediments was expanded beyond the observed limits of mixing. While this was not anticipated, it appears to be due to periodic closure of the outlet with Long Island Sound. Sound. W79-00441

MIXING IN AN ARCTIC FJORD, Institute of Ocean Sciences, Sidney (British Columbia), Frozen Sea Research Group. R. G. Perkin, and E. L. Lewis. Journal of Physical Oceanography, Vol. 8, No. 5, p 873-880, September 1978, 11 fig. 17 ref.

Descriptors: *Fjords, *Arctic, *Mixing, *Canada, On-site investigations, Bays, Basins, Water circulation, Wave(Water), Internal waves, Shores, Ice, Sea ice, Instrumentation, Water temperature, Salinity, Tides, Energy, Oceanography, *Combridge Bay(N WE) Salinity, Tides, En *Cambridge Bay(N W T).

Measurements made in Cambridge Bay, N.W.T., during the winter showed that the breaking of internal waves on the shore influences downward salt transport from the homogeneous surface layer produced by saline convection beneath sea ice during growth. Denser water from the shallows, where the depth of this convective layer is limited by the sea bed, flows down the slope to the layer interface contour where the breaking waves introduce turbulence, aiding mixing of the convecting water into the lower layer. Away from the boundaries, entrainment of salt from the lower to the upper mixed layer is aided by the internal waves on the interface. These two salt transports waves on the interface. These two sait transports (downward at the boundaries, upward over the basin) produce horizontal salinity gradients which overall make water in the shallows less saline than the surface layer of the basin. The energies available. ble for these mixing processes were estimated. (Sims-ISWS) W79-00487

BATHYMETRY AS AN INDICATOR OF NET CIRCULATION IN WELL MIXED ESTUARIES, South Carolina Univ., Columbia. Dept. of Geology; and South Carolina Univ., Columbia. Belle W. Baruch Inst. for Marine Biology and Coastal

Limnology and Oceanography, Vol. 23, No. 4, p 816-821, July 1978. 6 fig, 13 ref. EPA R802928.

Descriptors: *Water circulation, *United States, Descriptors: "Water circulation, "United States, 'Estuaries, 'Bathymetry, Tides, Tidal effects, Circulation, Coasts, Inlets(Waterways), Salinity, Sediments, Deposition(Sediments), Erosion, Scour, Currents(Water), Fathometers, Channels, Well-mixed estuaries.

In well-mixed, high salinity estuaries of the southeastern US, the net circulation is mirrored in the bathymetry. Measurements in North Inlet, South Carolina, indicated a net current reversal across the estuary. The cross section bathymetry is usually bimodal, with two channels separated by a shallow area. The deeper channel experiences

ebb-directed net flow with ebb-oriented sand waves as the predominant bedform. In the shal-lower channel, the net current is flood-directed. In well-mixed estuaries similar to North Inlet, it may be possible to determine qualitative circulation features from a few lateral and longitudinal bathymetric traces without measurements of cur-rent velocity and salinity. (Sims-ISWS) W79-00488

A COMPARISON BY SIZE CLASS AND VOLUME OF DETRITUS VERSUS PHYTOPLANKTON IN CHESAPEAKE BAY, Chesapeake Biological Lab. Solomons, MD.; and Maryland Univ., College Park. Department of Bottom. Botany. S. D. Van Valkenburg, J. K. Jones, and D. R.

Estuarine and Coastal Marine Science, Vol. 6, No. 6, p 569-582, June 1978. 3 fig, 7 tab, 26 ref. ERDA AT-(40-1)-4848. Descriptors: *Detritus, *Phytoplankton, *Size, *Volume, *Chesapeake Bay, Sampling, On-site data collections, On-site investigations, Marine biology, Plankton, Diatoms, Nannoplankton, Plankton nets, Data processing, Bays, Estuaries.

Relative numbers and sizes of detritus vs phytoplankton particles were determined by visual counting over a period of 17 months at a mid-bay station in a temperate estuary. Detritus averaged 76.6% of total particle numbers, the phytoplankton 23.4%. Seasonal variation in detritus numbers was minimal as compared to the strong summer pulse of the phytoplankton. Detritus numbers were concentrated in the smallest size category (64.7% at 2-5 micrometer) as were the phytoplankton (55.6% at 2-5 micrometer). Detritus particles also overshadow the phytoplankton in total volume present, representing 65.7% of total yearly volume, the remaining 34.3% of total volume representing live cells. The peak of detritus volume determined by visual counts is at the high end (20-35 micrometer), whereas phytoplankton volume peaks at mid ranges (5-20 micrometer). Phytoplankton occurrence and abundance, and the percent of phytoplankton volume contributed by counting over a period of 17 months at a mid-bay percent of phytoplankton volume contributed by each taxonomic class, are also recorded. (Simsterior W79-00494

ON GEOSTROPHIC ADJUSTMENT IN SEA STRAITS AND WIDE ESTUARIES: THEORY AND LABORATORY EXPERIMENTS. PART II -TWO-LAYER SYSTEM, Wisconsin Univ.-Madison. Dept. of Meteorology; and Wisconsin Univ.-Madison. Marine Studies

Journal of Physical Oceanography, Vol. 8, No. 5, p 861-872, September 1978. 6 fig, 11 ref, 1 append. NOAA 04-3-158-61.

Descriptors: *Flow, *Straits, *Estuaries, *Model bestriptors, 'rlow,' straits, 'Estuaries, 'Models, studies, Mathematical models, Hydraulic models, Laboratory tests, Channels, Channel flow, Fresh-water, Saline water, Saline water-freshwater inter-faces, Stratification, Oceans, Oceanography,

A frictionless, nonlinear model with allowance for motions which are far from a state of geostrophic balance was considered in order to describe the balance was considered in order to describe the dynamics of outflows consisting of two layers of fluids. The governing equations were solved by means of perturbation expansions, conformal mapping, and Fourier series. The theory was compared with laboratory experiments. The model predicted that an outflow from a channel with uniform velocity distribution deflects to the right in the Northern Hemisphere. The parameters of the problem were combined in such a way as to show that rotational effects are important when-ever the ratio between the internal Froude number to the Rossby number is not negligible; the inverse

of this ratio has a 'critical' value, below which the flow separates from the left basin bank. The mathematical analysis showed that an outflow from a channel with initial negative relative vorticity approximately equal to the Coriolis parameter deflects to the left. As in the uniform flow case, the flow separates from one of the banks under certain 'critical' conditions. Two experimental systems which included an abrupt cross sectional variation in a rotating channel consisting of two layers were used. The experimental results com-pared favorably with the direction of deflection predicted by the mathematical model. Possible ap-plication of this study to the Straits of Gibraltar and other outflows were discussed. (Sims-ISWS)

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

VAPOR COMPRESSION ENERGY REDUCTION BY VERTICAL TUBE FOAM EVAPORATION OF SEAWATER,

California Univ., Berkeley. Sea Water Conversion

H. H. Sephton.

In: Proceedings 6th International Symposium
Fresh Water from the Sea, Vol. 2, p. 141-146,
1978.(California Water Resources Center 1978.(California W Desalination Project).

Descriptors: *Vapor compression distillation, *Desalination plants, Evaporators, *Distillation, Vertical tube foam evaporation method, Energy, Sea water, Heat transfer.

Presented are experimental data obtained with a new vapor compression-driven vertical tube evaporation pilot plant having a capacity of 20 cu. meter per day of desalted seawater. Significant reductions in energy consumption are achievable for both the upflow and downflow modes of vertical tube evaporation with the vapor compression technique, by imposing foamy two-phase vapor-liquid flow over the heat transfer surfaces. This vertical tube foam evaporation method was shown to provide heat transfer performance enhance-ments of 38 and 75 percent for the downflow and upflow modes respectively, and corresponding vapor compression energy savings of 14 and 35 percent. W79-00015

PROCESS FOR THE TREATMENT OF WATER SOLUTION BY ION EXCHANGE, Hager and Elsaesser, Stuttgart-Vaihingen (West Germany). (Assignee). For primary bibliographic entry see Field 5F. W79-00054

DESALINATION PROCESS USING THER-MALLY REGENERABLE RESINS,
Rohm and Haas Co., Philadelphia, PA. (Assignee).
J. H. Barrett, and D. H. Clemens.
U.S. Patent No. 4,087,357, 8 p, 2 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Desalination, *Demineralization, *Water treatment, *Water purification, Resins, Ion exchange, *Hybrid resins,

A commercially economical desalination process employes thermally regenerable resins. The process utilizes hybrid resins which constitute a system made up of discrete weak acid and weak base resin particles. The hybrid resins are prepared by filling a macroreticular copolymer, usually termed 'host copolymer' with a cross-

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A-Saline Water Conversion

linked copolymer of a different nature termed a 'guest copolymer'. This process results in the location of one type of polymer in the pores and another type of polymer in the framework of the hybrid intermediate polymer. The process includes regenerating the hybrid ion exchange resins by elution with an aqueous liquid having a temperature greater than that of the liquid at the time of the absorption phase. (Sinha-OEIS)

REJECT STREAM REPLACEMENT STUDY.
Bureau of Reclamation, Denver, CO. Lower

Colorado Region. Status report, January 1978. 112 p, 12 fig. 2 tab, 21 ref.

Descriptors: "Desalination, "Reclaimed water, "Mexican Water Treaty, "Colorado River basin, "Water reuse, Canal lining, Ground water mining, Water quality standards, Water resources, Mexico, Gila Project, Saline soils, Desalination plants, International waters, All-American Canal, Salinity, Water quality, Water demand, Pumping, Saline water.

As a result of decreased natural runoff and increased amounts of saline ground water derived from the Gila Project, the salinity of the Colorado River water reaching the Mexican border in-creased to 1500 p/m in 1962. To comply with the Mexican Water Treaty standard of 800 p/m, the Bureau of Reclamation was authorized to build a desalination plant near Yuma, Arizona, capable of producing 97,000 acre feet of water. However, the highly saline reject stream from this plant would substract 42,000 acre feet of water which must somehow be replaced to supply the amount of water promised to Mexico. Rather than further diminish already minimal water supplies in the Southwest, Congress authorized a study to identify feasible methods to replace the reject stream water. The findings of an interdisciplinary team which examined 11 possible methods from the standpoint of technical, economic, social/environmental, and institutional considera-tions are summarized. Of these 11 methods, 7 are considered feasible alternatives and will be studied further. These are: lining a reach of the All-American Canal to salvage seepage; desalting sea water from the Pacific near Los Angeles; adding a desalting plant in the Imperial Valley, California; extracting geothermal fluid from the ground and desalting it using heat and pressure of the fluid it. sessing it using neat and pressure of the fluid itself for power; extracting ground water near the U.S. Army Proving Ground near Yuma; pumping ground water seepage flowing southward from the All-American Canal; increasing recovery rate of the Yuma plant from 70% to 90%. Full descriptions of these alternatives as well as the first tions of these alternatives as well as the four rejected plans are supplied, including maps, site plans, potential yields, and cost rates. Advantages and disadvantages of each are discussed and com-pared. (Majtenyi-IPA) W79-00092

LABORATORY STUDIES ON ADVANCED COMPOSITE H F MODULES FOR SEAWATER

REVERSE OSMOSIS,
Albany International Co., Dedham, MA. FRL Div.
M. J. Coplan, R. B. Davis, and J. H. Beale.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 990,
Price codes: A06 in paper copy, A01 in microfiche.
Report OWRT/S--78/14, (1978), 113 p, 21 tab, 46
fig, 13 ref. OWRT S-0089(No. 7508)(1).

Descriptors: *Desalination, *Membrane processes, *Reverse osmosis, Sea water, Brackish water, Membranes, Hollow fiber membrane module, *Composite membranes.

Work conducted under this contract is for the development of a reverse osmosis hollow fiber composite membrane targeted for single-pass seawater desalination. This membrane is comprised

of a furan-based rejecting barrier deposited on and near the surface of a microporous polysulfone holow fiber of dimensions typically 250u O. D. and 75u I. D. These dimensions are variable within limits and can be tailored to an application. Porous polysulfone fiber substrate is prepared by a regulated dry jet/wet spinning process. A typical batch preparation will convert a pound of commercial (Union Carbide) polysulfone into approximately 5,000 linear feet of 6-filament continuous yarn spun from a dimethylformamide base spin dope. The rejection barrier is a cross-linked furan resin formed in situ. It is negatively charged due to the existence of numerous sulfonate groups bound to the resin during polymerization, a condition expected to impact fouling resistance. The composite membrane system generally resembles the so-called 'NS-200' type, but significant changes in both form and chemistry have resulted from work carried out independently by the Contractor. Geometry of the fiber bundle and of the module have received much attention. The mechanics of winding and the resulting cross-wound configuration have been designed to minimize channeling and concentration polarization effects. A novel potting and fiber opening process have been perfected. W79-00300

INCREASED PRODUCT WATER RECOVERY BY REVERSE OSMOSIS USING INTERSTAGE ION EXCHANGE SOFTING AND A SPIRAC-TOR.

Permutit Co., Inc., Princeton, NJ. Research and Development Center.

Development Center.

A. B. Mindler, and S. T. Bateman.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 920, Price codes: A07 in paper copy, A01 in microfiche. Report OWRT/S--78-10, June 20, 1978. 121 p. 13 tab, 20 fig, 11 ref. OWRT S-0124(No 7554)(1).

Descriptors: *Desalination, Scaling, *Desalination processes, *Membrane processes, Reverse osmosis, *Brackish water, *Pilot plants, *Ion exchange, New Mexico, Gypsum scale, Crystal growth, Water treatment, Roswell(NM).

Pilot plant test result are discussed in which 67% increased water recovery was obtained from simulated RO concentrate of high calcium-high sulfate water similar to projected Yuma Desalination Facility reject operated at 70% recovery; i.e. an overall recovery of 90%. The self-sustaining system consisted of ion exchange softening of interstage concentrate using as regenerant salt, only the final reject from Secondary RO and no imported salt. No antiscalant was used for protection of either the IX or RO systems. The level of regeneration was enhanced by reuse of previously used regenerant, desupersaturated with respect to gypsum by a fluidized seed bed crystallizer, a Spiractor. Capital and annual costs are projected. Two RO systems were employed for desalination of the softened concentrate -(a) dupont4 inch B-10 Polyamide Seawater Hollow Fiber System consisting of three permeators in 2:1 array producing 5400 gpd product water and (b) Envirogenics 498-40 Spiral Wound Cellulose Acetate Blend elements consisting of three two-element vessels in 2:1 array and operated in a partial recycle mode producing 4500 gpd product water. The test work was performed at Roswell Test Facility on chemically 'doctored' blended city and brackish well water over an operating period of 1100 hours and 41 ion exchange cycle, during which the Spiractor removed 2650 lbs. of granular gypsum.

FINAL REPORT ON FIELD TEST EVALUA-TION AND OPERATION AND MAINTENANCE OF SEAWATER REVERSE OSMOSIS AND ELECTRODIALYSIS PILOT PLANTS AT WRIGHTSVILLE BEACH TEST FACILITY, NOVEMBER 1976.

Kaiser Engineers Oakland, CA. K. Patel, and F. Harris. Available from the National Technical Information Service, Springfield, VA 22161 as PB-287987, Price codes: A07 in paper copy, A01 in microfiche, Report OWRT/S--78/13, November 1976. 128 p, 38 tab, 35 fig. OWRT 14-30-3175 and 14-34-0001-6512(1).

Descriptors: *Desalination plants, Desalination processes, *Membrane processes, *Reverse osmosis, *Pilot plants, Pre-treatment(Water), Treatment facilities, *Coagulation, Sea water, *Electrodialysis, Thin-Film Composite Membranes, Plugging Index, Dechlorination, Fouling control, Wrightsville Beach(NC), North Carolina.

Three seawater pretreatment systems, three reverse osmosis (RO) membranes and two electrodialysis pilot plants were tested at OWRT's Wrightsville Beach Test Facility between July 1975 and August 1976. Pretreatment testing has shown that a minimum of 25 mg alum per liter of seawater was required to obtain settleable flocs in clarifiers followed by a dual-media and polishing filtration to obtain 5 minute-and 15 minute-plugging indices less than 30 and 50 respectively, considered by RO manufacturers as indicative of acceptable feed water quality. Testing of in-line coagulation followed by dual-media and polishing filtration indicated an effluent with a 15 minute-plugging index less than 60 and often less than 50 may be obtained with use of only 10 mg/l alum. It was also found that the use of garnet media in filters greatly improved filtrate quality. The use of clarifiers provides a consistent prefit quality of seawater supply to the filters and smooths out influent quality fluctuations. However, in-line coagulation is economically very attractive and its optimization should provide acceptable feed quality at considerably less cost than the present estimates published in literature.

W79-00302

HIGH TEMPERATURE ELCTRODIALYSIS-PHASE VI,

PHASE VI, Lonics, Inc., Watertown, MA. F. B. Leitz, H. I. Viklund, and A. D. Jha. Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 002, Price codes: A05 in paper copy, A01 in microfiche. Report OWRT/S--78/11, March 1975. 87 p, 6 tab, 24 fig, 6 ref. OWR T 14-30-3084(1).

Descriptors: *Desalination, *Electrodialysis, *Membrane processes, Seawater, *Pilot plants, North Carolina, Desalination processes, Cost estimate, Wrightsville Beach(NC), Gasket Separators.

The overall objective of this program is the development of reliable, improved electrodialysis technology for sea water desalination. The principal improvements are use of thinner components than are currently employed in commercial apparatus and operation at higher than ambient temperature. On the previous phase of Contract No. 14-30-3084, two test stacks and a test rig of flexible application were constructed and shop tested. The present phase of the work has been dedicated to field testing the stacks at the Wrightsville Beach Test Facility. The test rig was designed to contain only one electrodialysis stage. With a single stage, batch operations is required to produce a product of acceptable salinity. To interpret the data from the batch runs, a computer model of the unit was developed. This model was used to simulate the performance under a wide variety of conditions. These simulations with appropriate economic factors were used to calculate the cost of desalting sea water under specified conditions. Under reasonable conditions, the cost of product water ranged from 0.26 to 0.46 5 per cubic meter (\$1.00 to \$1.75 per thousand gallons). The increase in price over previous estimates is due partly to more accurate knowledge of the system but primarily to increase costs of power and increased costs of components. (See also W76-03148; W74-08070; W74-08069 w74-08068 and W74-08067)

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Conservation In Domestic and Municipal Use—Group 3D

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DEVELOPMENT OF LOW COST MEMBRANE CLEANING AGENTS, Grace (W. R.) and Co., Columbia, MD. J. Block. Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 989, Price codes: A07 in paper copy, A01 in microfiche. Report OWRT/S--78/12, October 1977. OWRT 14-34-0001-6509(1).

Descriptors: *Desalination, Scaling, *Desalination processes, *Membrane processes, Reverse osmosis, *Brackish wate, *Pilot plants, Electrodialysis, Water treatment, Chemical cleaning (Membranes), Gypsum scaling removed, Wellton-Mohawk Ariz.

The study included a laboratory phase and a field-test phase. In the laboratory phase using either a synthetic water or Wellton-Mohawk canal water, scales were deposited on cellulose acetate RO membranes. Cleaning tests were performed with various chemicals and combinations of chemicals. For gypsum scales, a combination of EDTA, ammonium bicarbonate and a fluorocarbon surfac-tant was found to be more effective than EDTA alone, or any other forumlation tested. Ammoni-um bifluoride was found to be best for SiO2 cales, whereas sodium hydrosulfite was best for iron-containing scales. Experiments were also run on the effectiveness of several commercially available scale inhibitors for the inhibition of calcium carbonate and gypsum scales. These results showed that products' marketed by Monsanto and Aquaness were most effective for the inhibition of calcite and gypsum, respectively. The field-test portion of the program showed that the predominant scale deposit obtained was a clay-like material composed of Si, Al, Ca, Mg and Fe. These deposits are extremely difficult to remove and were only partially removed by some of the better performing cleaners tested in the laboratory. W79-00304

3B. Water Yield Improvement

WATER HARVESTING FOR AFFORESTA-TION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,

Research Inst. of Forests and Rangelands, Tehran

P. Mehdizadeh, A. Kowsar, E. Vaziri, and L.

Soil Science Society of America Journal, Vol. 42, No. 4, p 644-649, July-August 1978. 5 fig, 3 tab, 21

Descriptors: *Water harvesting, *Impervious membranes, *Asphalt, *Runoff, Vegetation establishment, Trees, Arid lands, Watersheds(Bassins), Forestry, Soils, Foreign countries, Foreign research, Soil sealants, Soil treatment, Soil water, Soil moisture, *Iran, Green-balte, Sail water specified. belts, Soil water potential.

The water required to irrigate greenbelts being established around cities in Iran is a major cause of concern in a country with insufficient supplies. Methods of afforestation which do not require irrigation must be found. One such method is to concentrate water, received by a watershed without vegetation, for distribution over a smaller area vegetation, for distribution over a smaller area where plants are growing by making portions of the watershed area impervious to water through application of asphalt. This principle was tested on most f plots 2 m wide and 10 m long. Runoff from each plot was measured to study its variations as a function of age of asphalt cover and rainfall amount and intensity. The concept was further tested by constructing 2-m wide terraces along contour lines at 5-m intervals on a hillside with a stone of about 10%. The species ecologically slope of about 30%. Tree species, ecologically adapted to the area, were planted on the terraces. Calibrated gypsum blocks were placed at depths of of 10 and 30 cm in the terraces and at depths of 10 and 30 cm in the watershed area between the terraces to measure soil water potentials. As the

asphalt membrane aged, its efficiency in inducing runoff decreased. The runoff efficiency was nearly 75% initially, but decreased to 25% after 4 years. A regression equation was obtained correlating the runoff efficiency with age of the asphalt membrane. Freezing and thawing of the soil, growth of plants, and shrinking and swelling of clays resulted in the deterioration of the membrane. brane. It remained effective for about 5 years. (See also W77-00475) (Sims-ISWS) W79-00474

WATER HARVESTING FOR AFFORESTA-TION: II. SURVIVAL AND GROWTH OF TREES,

Research Inst. of Forests and Rangelands, Tehran

A. Kowsar, P. Mehdizadeh, E. Vaziri, and L. Boersma.

Soil Science Society of America Journal, Vol. 42, No. 4, p 650-657, July-August 1978. 2 fig, 9 tab, 17

Descriptors: *Water harvesting, *Impervious membrane, *Soil-plant-water relationships, *Plant growth, Trees, Runoff, Vegetation establishment, Arid lands, Watersheds(Basins), Forestry, Soil sealants, Soil treatment, Soil water, Foreign countries, Foreign research, Soil moisture, *Iran, Greenbelts.

Alternative methods of afforestation which do not require irrigation must be developed for arid re-gions. One such method is to concentrate water received by a watershed without vegetation on a received by a watershed without vegetation on a smaller area where trees are planted. This can be done by making portions of the surface of a watershed impervious to water through application of asphalt. This principle was tested near Tehran, Iran, by constraining 2-m wide terraces on contour lines at 5-m intervals resulting in a watershed to spreading area ratio of 1.5. Asphalt was sprayed at the rate of 1 liter/sq m in December 1969. Seedlings of Robinia pseudacacia L., Cupressus arizonica G., and Fraxinus rotundifolia Mill., tree species commonly used in irrigated afforestation projects in Iran, were planted in March 1970 on the terraces. Runoff from asphalt-treated 1970 on the terraces. Runoff from asphalt-treated areas did not significantly increase the survival of the tree seedlings. The 23.4 mm of rain in July 1970, completely overwhelmed treatment effects. This rain was a rare event for the Tehran area. The increases in growth of height, crown cover, and stem cross section due to the asphalt treatment at the end of a 5-year period were 61.5, 60.9, and 53.0%, respectively, for Robinia pseudacacia L.; 14.6, 15.4, and 31.6%, respectively, for Cupressus arizonica G.; and 29.4, 79.6, and 23.9%, respectively, for Fraxinus rotundifolia Mill. (See also W79-00474) (Sims-ISWS)

3C. Use Of Water Of Impaired Quality

PRELIMINARY IDENTIFICATION OF THE SALT PICK-UP AND TRANSPORT PROCESSES IN THE PRICE RIVER BASIN, UTAH, Utah Water Research Lab., Logan.
J. P. Riley, D. S. Bowles, D. G. Chadwick, and W.

I. Grenney.

Paper presented at the Third International Hydrology Symposium, Fort Collins, Colo. February 1977, 15 p. OWRT-A-039-UTAH(1), 14-34-0001-094.

Descriptors: Transport depletion, Saline water, *Salinity, *Utah, Salt transport(Rivers), *Price River(Utah).

The Price River is a significant contributor of salt to the Colorado River. Relatively pristine waters leaving the upper elevations of the basin degenerate into highly saline waters entering the Green River. The primary reason for this deteri-

oration is the contact of the river with the Mancos shale, a marine shale, which underlies most of the central basin. The structure of an evolving model of the salt pick-up and transport processes in the Price River Basin is presented. The initial purpose of the model is to aid in the identification of the natural and man-modified hydro-salinity-sediment system of the basin. This identification procedure will result in both a better qualitative understanding of the important physiochemical processes, and in a mathematically precise description of these processes. When the identification stage is complete, the model will be used as a management tool for such purposes as examining various strategies for reducing salt loads in the Price River and in other similar rivers. W79-00145

DIGGING FOR NEW SOURCES OF ENERGY. For primary bibliographic entry see Field 8B. W79-00175

CORRELATION BETWEEN THE SALT CON-TENT IN THE HARD PHASE AND SOIL SOLU-TIONS OF THE MURGHAB OASIS DESERT-MEADOW SOILS OF ANCIENT IRRIGATION, (IN RUSSIAN),

For primary bibliographic entry see Field 2G. W79-00203

IRRIGATION EFFICIENCY, A BIBLIOG-RAPHY, VOLUME 3.

Department of the Interior, Washington, D. C.,
Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.

W79-00307

NUMERICAL STUDY OF CONTINUOUS SAL-TATION, New South Wales Univ., Kensington (Australia).

School of Mechanical and Industrial Engineering. For primary bibliographic entry see Field 8B.

NATURE AND IMPACT OF RURAL STREAM INPUTS ON WATER QUALITY, North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 5C. W79-00483

3D. Conservation In Domestic and Municipal Use

WASOPT USERS MANUAL: AN INTEGER PROGRAMMING METHODOLOGY FOR MUNICIPAL/REGIONAL WATER SUPPLY PLANNING, Utah Water Research Lab., Logan.

For primary bibliographic entry see Field 6A. W79-00002

CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF, Colorado Univ., Boulder. Dept. of Civil Environ-mental and Architectural Engineering. For primary bibliographic entry see Field 5B. W79-00005

WATER REUSE AT HIGHWAY REST AREAS: EVALUATION PHASE, Virginia Highway and Transportation Research Council Charlottesville. For primary bibliographic entry see Field 5D. W79-00087

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3D—Conservation In Domestic and Municipal Use

RELATION RETWEEN THE ST. LOUIS URBAN PRECIPITATION ANOMALY AND SYNOPTIC WEATHER FACTORS, Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 2B. W79-00328

RESIDENTIAL WATER CONSERVATION, Colorado Univ., Boulder.

V. P. Weakley. Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 157, Price codes: All in paper copy, A01 in microfiche. Master of Science Thesis, 1977. 234 p, 14 fig, 37 tab, 5 append. OWRT A-030-COLO(1).

Descriptors: *Cities, *Planning, *Water supply, *Costs, Economics, *Prices, *Conservation, *Demand, *Water conservation, Direct reuse, Water consumption, Water requirements, Cost comparisons, Elasticity of demand, Water rates, Colorado, Denver(Colo), Lyons(Colo).

The feasibility of using various water conservation measures to reduce residential water demand was examined. Ten conservation techniques were found to be relevant. These included meters, recycle systems, devices, pressure and flow reducers, public education, restrictions, building and plumbing codes, horticultural changes and pricing. Each measure was evaluated and various combinations were assessed to develop viable alternative options. Costs and benefits were also evaluated. Water savings of 30 to 40% were possible through imposition of programs of water conservation. A case example of application of such a program for Lyons, Colorado is included. 79-00440

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES.

Chicago Univ., IL. For primary bibliographic entry see Field 6D. W79-00453

FACTORS AFFECTING THE QUALITY OF URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNES-

Tennessee Univ., Knoxville. Dept. of Civil Engineering For primary bibliographic entry see Field 5B.

W79-00456

3E. Conservation In Industry

MANAGEMENT EVALUATION MODEL FOR PENNSYLVANIA, Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineer-

ing. For primary bibliographic entry see Field 6D.

THE DEVELOPMENT OF THE ELECTRICAL POWER SYSTEM IN THE PACIFIC NORTHWEST, A PUBLIC POLICY PERSPEC-

Washington Univ., Seattle. For primary bibliographic entry see Field 6E. W79-00143

RESOURCES.

REGIONAL ELECTRIC ENERGY PLANNING: A CASE STUDY IN THE POLITICS OF SCARCE

Washington Univ., Seattle. For primary bibliographic entry see Field 6E. NEKOOSA CLEANS CONDENSATES WITH STEAM DISTILLATION,
Mo Do Mekan, London(Ontario).
For primary bibliographic entry see Field 5D.
W79-00162

WASTE WATER TREATMENT AND RE-USE WITHIN THE T: XTILE INDUSTRY, For primary bibliographic entry see Field 5D. W79-00165

TEXTILE WASTE WATERS: TREATMENT AND ENVIRONMENTAL EFFECTS, Water Pollution Research Lab., Stevenage Pollution Research Lab., Stevenage

Water Poliution Research (England). D. K. Gardiner, and B. J. Borne. Journal of the Society of Dyers and Colourists, Vol. 94, No. 8, p 339-348, August, 1978. 2 fig, 3 tab, 33 ref.

Descriptors: *Textiles, *Dyes, *Bleaching wastes, *Water reuse, *Reclamation, Water pollution sources, Chemical wastes, Organic wastes, sources, Chemical wastes, Organic wastes, Biological treatment, Inorganic compounds, Centrifugation, Activated carbon, Coagulation, Floculation, Flotation, Dialysis, Adsorption, Tertiary treatment, Oxidation, Membrane processes, Filtration, Separation techniques, Color, Sludge disposal, Treatment facilities, Waste water treatment, Industrial wastes.

The characteristics, treatment, and impact of textile processing effluents are reviewed. Average ef-fluent volumes of 0.18 cu m/kg of cotton or manmade fiber and 416 cu m/day from wool processing are produced; mixed textile wastes contain 264-3070 mg BOD/liter. Final mercerizing, bleaching, and dyeing rinse waters may be sufficiently dilute for reuse; scouring liquors and combined process effluents are generally too highly contaminated for recycling. Secondary treatment of combined domestic wastes and pretreated mill effluent can provide the advantages of nutrient sources, dilu-tion, more convenient sludge treatment, and better treatment supervision. Effluent pretreatment before discharge to a sewer system should include sulfate and hydrogen sulfide removal, volatile sol-vent removal, and fat and grease reduction. In-plant recovery and reuse can be accomplished by: caustic soda extraction by filtration-dialysis or centrifugation-evaporation; carboxymethylcellu-lose precipitation by calcium oxide or carbon dioxide; and aze dye stripping by centrifugation and solvent extraction. Dilute rinse waters may be reused after pH adjustment, primary coagulation and flocculation, biochemical or physical-adsorption treatment, or polishing. Color can be remove by: chemical coagulation and separation, bioadsorption and biochemical oxidation, activated carbon adsorption, chemical oxidation, and mem-brane filtration. Process chemicals, surfactants, foam, and grease can hinder biological treatment; textile sludges may contain high levels of organic compounds, heavy metals, and grease, making disposal or treatment difficult. (Lisk-FIRL) W79-00166

WATER REUSE: A TRICKLE BECOMES A TORRENT,

Chemical Engineering, Vol. 85, No. 10, p 44, 46, 48, April 24, 1978.

J. C. Davis.

Descriptors: *Water reuse, *Pulp and paper industry, Water conservation, Water pollution sources, Recycling, Chemical industry, Freshwater, Oil in-dustry, Industrial water, Water requirements.

Water reuse practices in the chemical process in-dustries (CPI) are changing. Most companies throughout the U.S.A. are recycling more water and consuming less fresh water, and this pattern is expected to hold through the end of the century. The chemical and allied products, petroleum refin-ing, and pulp and paper spectors of the CPI con-

sume nearly two-thrids (almost 100,000 million gal/day) of industry requirements. Typica of water recycling efforts, Scott Paper Co. at Fort Edward, New York, has reduced the mill's fresh water requirements from 10 million to 2.3 million gal/day. (Witt-IPC)
W79-00400

HOW KIND TO THE RESOURCES IS THE GRINDING PROCESS. (HVOR RESSURSVENN-LIG ER SLIPEPROSESSEN),

egian Pulp and Paper Research Inst., Oslo. J. A. Oksum. Norsk Skogindustri, Vol. 32, No. 2, p 37-40, February, 1978. 9 fig, 2 ref.

Descriptors: *Water conservation. *Groundwood mills, Foreign countries, Europe, Energy, Conservation, Water consumption, Organic matter, Pulp and paper industry, Water pollution sources, Water pollution control, Water quality control, Heat exchangers, Water cooling, Freshwater, Temperature, Norway, White water(Paper machines).

A resource utilization study conducted by the Norwegian Pulp and Paper Research Institute aimed at helping market groundwood mills to improve their fiber, water, and energy conservation. The importance of water consumption to losses of solid and dissolved organic matter is pointed out. Material balances are calculated and used to prepare energy balances which, in turn, made it possible to estimate the importance of heat exchangers in the white-water circuit. Mills which cannot cool water with heat exchangers must con-sume considerable volumes of freshwater to maintain a satisfactory system temperature. Assuming a constant quality of incoming wood supply, the dissolution of organic matter at constant temperature is totally dependent on the energy input (measured as pulp freeness). Whether this dis-solved material leaves the mill within the product or with the effluent is governed by the specific water consumption (per ton of groundwood pulp). Obviously, lowering the freshwater intake will increase the mill's productivity. (Brown-IPC) W79-00408

STEAM STRIPPING REDUCES CONDENSATE AT WEYCO MILL, Weyerhaeuser Co., Springfield, OR. J. W. Grant.

Paper Trade Journal, Vol. 162, No. 9, p 47, May

Descriptors: *Pulp wastes, *Waste water treat-ment, *Condensates, *Steam, Effluents, Pulp and paper industry, Wastes, Industrial wastes, Waste reatment, Biochemical oxygen demand, Oregon, Costs, Aerated lagoons, Water pollution treat-ment, Water pollution sources, Evaporators, Board mills, Kraft mills, Air pollution.

Steam stripping of high-BOD condensate streams from the batch digester blow and relief system, the Kamyr continuous digester flask tank, and the Kamyr continuous digester Hask tank, and the multiple-effect evaporators is practiced at the kraft linerboard mill of Weyerhaeuser Co. in Springfield, Oregon. Vapor recompression prevaporation ensures the capture of 80% of the BOD, largely in the form of combustible methanol. Cost savings resulting from a decrease in BOD discharged to the aeration basin are considerable. (Swichtenberg-IPC) W79-00409

LOOKING AT THE POSITIVE SIDE OF ENER-GY REGULATION, Fraser Companies Ltd., Madawaska, ME.

Magazine, Vol. 60, No. 4, p 15-16, 19, April, 1978. 2 illus.

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WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

Descriptors: "Pulp and paper industry, "Legislation, "Energy, Water conservation, Maine, Flow, Industrial water, Water requirements, Closed systems, Paper machines.

though government regulations are commonly Although government regulations are commonly believed to cause increased capital investments and higher operating costs, their positive impact on energy consumption in the pulp and paper industry cannot be forgotten. At Fraser Companies Ltd. (Madawaska, Maine), compliance with the Clean Water Act has reduced water flow and loss of fibers and fillers by nearly 45% over a 3-yr period, thereby decreasing the input of virgin raw materials and the energy needed to produce them. Closed-evele water supply to paper machines has Closed-cycle water supply to paper machines has conserved energy by reducing the loss of hot process water from the system. (Swichtenberg-

HOW TO UTILIZE STEAM FROM THER-MOREFINERS. (HUR UTNYTTJA ANGA FRAN TERMORAFFINOERER), Chalmers Univ. of Technology, Goteborg

(Sweden). L. Jarlevang, and T. Johansson. Svensk Papperstidning, Vol. 81, No. 6, p 183-185, April 10, 1978. 2 fig, 1 ref, 3 tab.

scriptors: *Steam, *Thermomechanical pulpng, "Energy conservation, Utilization, Pulp and paper industry, Electric power production, Heat-ing, Steam turbines, Water conservation, Refiners(Mechanical).

In the manufacture and processing of thermomechanical pulp, large amounts of steam (about 2 tons/ton of thermomechanical pulp) are liberated, usually at atmospheric pressure, which can be utilized in 3 alternative ways: (1) recompression to increase the steam pressure so as to utilize its heat content at elevated temperature; (2) transition in a confidence to the processor. expansion in a condensing turbine to generate mechanical or electric energy with which the energy demand of the refiner can be reduced by about 12%; and (3) utilization for remote heating of buildings. The first two alternatives gives approxi-mately equal benefits for a 100,000 ton/yr installation, although the condensing turbine may offer slight advantages over vapor recompression. The third possibility is only of subordinate interest. (Brown-IPC) W79-00418

THE CLOSED MILL CONCEPT, International Paper Co., Mobile, AL.

TAPPI Papermakers Conference, Atlanta, Georgia, April 10-12, 1978. Preprinted Proceedings (TAPPI, Attlanta, Geogia), p 121-124. 13 ref.

Descriptors: *Pulp and paper industry, *Water conservation, *Water reuse, Water pollution control, Wastes, Industrial wastes, Water pollution ources, Recycling, Legislation, Industrial water, Pulp wastes, Costs, Economics, Closed systems.

To implement a closed mill system, effluent water to implement a closed mill system, efficient water which has been sufficiently purified to be suitable for dilution or cleaning purposes must be sparated from the high-solids concentrate, and storage must be available to accommodate all internal fluids from the mill. Advantages of a closed system include significantly decreased expenses for providing and preparing fresh water, decreased treatment needs before the release of final effect, and improved public image. Disadvantages include reduced production (caused by requirements such as increased addition of retention sids), increased corrosion (caused by increase of dissolved salts), and other potential problems, ussoived saits), and other potential proteins, such as excessive temperature build-up, unacceptable, bacterial growth, product mottle, color writations, pH control, slime, foam, pitch, and felt and wire plugging. There is also a strong

phychological resistance to the closed mill system. Examples of closures at 3 mills are discussed. One of the major complaints against the closed mill concept involves federal regulations: because of time limitations, imposed expenditures are man-dated, and the rate of spending is uncontrolled. (DuVall-IPC)

3F. Conservation In Agriculture

STOMATAL AND NONSTOMATAL REGULA-TION OF WATER USE IN COTTON, CORN AND SORGHUM, Texas Tech Univ., Lubbock. Dept. of Plant and

Soil Science.
For primary bibliographic entry see Field 21.

WATER RELATIONS AND PHYSIOLOGICAL ACTIVITY OF POTATOES,
Texas Tech Univ., Lubbock, Dept. of Plant and

For primary bibliographic entry see Field 2I. W79-00017

ANGULARITY SENSOR MEANS FOR CENTER PIVOT IRRIGATION SYSTEM, Toro Co., San Marcos, CA. (Assignee).

U.S. Patent No. 4,085,771, 7 p, 7 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1306, April 25, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, Application equipment, Lateral conveyance structures, Water

A center pivot irrigation system has propelled ar-ticulated span units mounting interconnected sec-tions of water carrying conduit. Each span unit has a motor and a motor control for regulating the operation of the system to maintain the span units in a pre-determined relative alignment in a vertical plane revolving about a vertical line at the center plane revolving about a vertical line at the center pivot of the system. The control has an angularity sensor which is connected between span units for sensing in a substantially horizontal plane changes in angularity between the span units relative to the desired revolving vertical plane. (Sinha-OEIS) W79-00023

FLOW REDUCING DEVICES PARTICULARLY USEFUL AS DRIP EMITTERS FOR DRIP IR-RIGATION,

U.S. Patent No. 4,084,749, 7 p, 7 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 962, April 18, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, *Flow control, Application equipment, Water delivery, Drip ir-

Flow-reducing devices particularly useful as drip emitters comprise a housing having a closure cap snap-fitted and enclosing a flow-retarding member snap-fitted and enclosing a flow-retarding member formed with recesses on opposite faces. Each recess is bridged by a pair of holes to provide a serial path for the flow of the water through the holes from one face to the opposite face. Also described is the use of a regulator including a valve member sensing the fluid pressure at the inlet of the device to produce a substantially uniform output of water despite variations in the line pressure at the inlet. (Sinha-OEIS)
W79-00031

TWO-STEP ROLL AHEAD IRRIGATION SYSTEM, R. D. Boone, and C. Griffin.

U.S. Patent No. 4,084,610, 8 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 912, April 18, 1978.

Descriptors: "Patents, "Irrigation, "Irrigation systems, "Irrigation efficiency, Application equipment, Operation and maintenance.

An irrigation system is moved with an oscillating An irrigation system is moved with an oscillating trojan bar operating against a lugged wheel. A drive pawl on the trojan bar drives the wheel forward on level ground or uphill. A hold-back pawl on the trojan bar keeps the wheel from running free when going downhill. The detent likewise contains an uphill pawl and a downhill pawl. (Sinha-OEIS). W79-00032

DRIP IRRIGATION SYSTEM.

Du Pont de Nemours (E. I.) and Co. Wilmington, DE. (Assignee).

U.S. Patent No. 4,086,774, 4 p. 3 fig. 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 42, May 2, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation systems, *Irrigation efficiency, *Flow control, Water delivery, Application equipment, *Drip ir-

A drip irrigation system is disclosed in which individual drip irrigation tubes are fed from a header by means of a flow controller which feeds water to the irrigation tube at an essentially uniform rate over a wide variety of pressures in the header. Generally the flow controller will be capable of maintaining the flow within + or - 15% of a predetermined value within a pressure variation of from 3 to 60 psi. The flow controller is a housing containing a deformable member which deforms increasingly in response to water pressure. The more the deformable member deforms the smaller the effective opening controlling the water flow becomes so that the gallons per minute of water received by the drip irrigation tube remans relatively constant. (Sinha-OEIS)

ABOVEGROUND SPRINKLING DEVICE FOR SPRINKLING SYSTEM, V. J. Traina.

U.S. Patent No. 4,087,-49, 6 p, 9 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 137, May 2, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, *Irrigation systems, Irrigation efficiency, Application equipment, Water delivery.

An aboveground sprinkling device has a sprinkler An aboveground sprinkling device has a sprinkler head at the center of its upper surface and has four sockets spaced at ninety-degree intervals around its side edge, all leading in to a central chamber immediately below the sprinkler head. An integral holding spike extends down from the bottom of the sprinkler head, preferably at the center, for holding the sprinkling device in a selected location. The spike is shaped to resist rotation. A set of nites is provided to close the sockets that are not plugs is provided to close the sockets that are not to be used. A hose or hoses can be secured to any one of the sockets or to several of them or to all of them to incorporate the device in a continuous sprinkler system employing a number of these sprinkling devices. The sockets not connected to hoses are plugged. (Sinha-OEIS) W79-00059

WATER AND AIR SCIENCES RESEARCH

Science and Education Administration, Washing-For primary bibliographic entry see Field 2G.

W79-00105

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Association) 9, April, 1978.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

NITRATE REDUCTASE ACTIVITY OF SOYBEANS IN RELATION TO OTHER INDICA-TORS OF WATER STRESS, Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 21.

EFFICIENCY OF SCREENLESS WELLS FOR

Ministry of Reclamation and Water Management, Moscow (LISSR).

Y. Bogomolov, R. Stankevich, and N. Lapshin. ICID Bulletin, Vol. 27, No. 2, July, 1978, p 77-80. 5

Descriptors: *Wells, *Well screens, Aquicludes, Aquifer testing, Aquifer characteristics, Exploration, Well construction, Intakes.

Problem related to the construction and use of screenless wells in artesian sand aquifers are discussed. There is more water intake surface and less hydraulic resistance in a screenless well which ensures high, steady yields for irrigation, water supply and dewatering. The major requirement for screenless wells is the availability of a steady upper confining bed overlying a sand aquifer. The confining bed must be fully penetrated by casing The use of screenless wells in aquifer testing provides more accurate information on the hydrogeologic parameters of aquifers. The use of small-diameter screenless wells in aquifers previ-ously regarded as non-productive has facilitated development of large scale water supplies. Screen-less wells reduce the costs of ground-water ex-ploration and management well construction and operation of water intake structures. Further research and development of screenless wells will contribute significantly to well drilling technology. (Purdin-NWWA) W79-00184

AND LAND RESOURCE ACCOM-PLISHMENTS 1975. SUMMARY REPORT. Bureau of Reclamation, Washington, Economics and Program Analysis Branch. Federal Reclamation Projects, 57 p, 7 tab. One of 4 volumes. (1976).

Descriptors: *Land reclamation, *Irrigation programs, *Crop response, *Irrigable land, *Flood control, Irrigation operation and maintenance, Recreation, Use rates, Hydroelectric power, Crop yield, Water supply, Agriculture, *Soldier Cree Dam(UT), *Western United States States. *Environmental enhancement, Research and development, Irrigation management service, Youth conservation corps, Nonagricultural lands.

This volume is the annual report of the Bureau of Reclamation water and land resource accomplish ments for 1975. These accomplishments are in the areas of irrigation; development of municipal, in-dustrial and other nonagricultural water supplies; recreation; flood control; and power. Summaries of planning construction and research activities are also provided, as well as environmental enhancement activities, youth conservation programs and foreign activities. The report investigates these areas in detail and furnishes data on subjects such as acreage, yield, production, extension of irrigation to new lands, gross value of crops grown on all Reclamation projects, popula-tions served by projects and other subsections of the areas. The focus is from a national viewpoint looking at the western half of the United States. Accomplishments by Reclamation project opera-tions in 1975 were achieved through facilities consisting of 326 storage reservoirs, 355 diversion dams, 14,320 miles of canals, 900 miles of pipeline, 230 miles of project drains, 142 pumping plants, 50 power plants, and 16,250 circuit miles of transmission lines. These facilities include those constructed by others and in operation on Reclama-tion projects. These project facilities are usually

constructed by the Bureau of Reclamation, but the maintenance of the facilities is turned over to local water users as they become capable of administering them. Three appendices provide statistical summaries for Reclamation project data. (See W79-00192 thru W79-00194) (Coan-NC) W79-00191

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX

Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. Federal Reclamation Projects, 284 p, Appendix 1 of 3 plus Summary Volume (1976).

Descriptors: *Cultivated lands, *Crop value *Productivity, *Recreation usage, *Water dis-Productivity, *Recreation usage, *Water tribution, *Land reclamation, *Irrigation tribution, *Land reclamation, *Irrigation programs, Water resources, Land resources, Agriculgrams, water resources, Land resources, Agricu-ture, Regional analysis, Pacific Northwest Region, Mid-Pacific Region, Lower Colorado Region, Upper Colorado Region, Southwest Region, Upper Missouri Region, Lower Missouri Region, Acquired lands, Withdrawn lands, Easement lands, Western United States.

This volume is one of 3 statistical appendices to the 70th annual report on water and land resource accomplishments of the Bureau of Reclamation. It contains administrative information for use by the Bureau and others wishing detailed information on specific Reclamation projects. It includes regional and project data on acreage, yield, production, and gross value of crops grown; land utilization water distribution; status of Reclamation lands and other related topics. Regional summaries are provided for seven major regions of the United States-Pacific Northwest, Mid-Pacific, Lower Colorado, Upper Colorado, Southwest, Upper Missouri, and Lower Missouri regions. Detailed project data are presented. This statistical appendix provides information useful to analysts preparing economic and financial studies of Reclamation projects. The appendix has also been used in the settlement of disputes arising out of conflicts over water charges and allowances, crop damage claims, operation and maintenance charges, and adjustment to repayment contracts. This statistical series is intended to be an annual project so that minute historical investigations may be plished. (See also W79-00191) (Coan-NC) W79-00192

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES. Reclamation, Economics and Program Analysis Branch.
Federal Reclamation Projects, 190 p. Glossary, Appendix 2 of 3 plus Summary Volum

Descriptors: "Hydroelectric power, "Investment, "Repayment contracts, "Construction costs, 'Irrigation programs, "Annual costs, "Cost repay-ment, Irrigation facilities, Debt, Cost allocations, employment, Land resources, Water resources, Return(Monetary), "General Reclamation statistics, "Federal funds, "Nonagricultural lands, "Municipal water, "Industrial water, Annual ap-propriations, Irrigable acres, Western United States.

This volume is one of 3 statistical appendices to the 70th annual report on water and land resource accomplishments of the Bureau of Reclamation These sets of summary tables provide extensive documentation of various aspects in Bureau Reclamation projects. The volume makes availa-ble annual tables of key financial and physical statistics. Included among the most important financial statistics are repayment of Reclamation Project construction costs and repayment of reim bursable costs, by repayment contracts and com-

mercial power revenues, and statements of net inmercial power revenues, and statements or net in-come from various irrigation and electric power operations. Important physical data statistics are storage and conveyance features in operation, storage dams, dikes and reservoirs, diversion dams, and carriage facilities for canals, pipelines and tunnels. A major section deals with power plant and transmission line data giving their physical features and generation and sale of energy. Another section of tables deals with the history of Congressional appropriation acts making funds available for Reclamation projects. The source and disposition of the Reclamation Fund is broken down by listing accretions, collections, reimbursements, and loans to the fund. The appendix also includes a glossary of critical terms requiring specific definitions for proper interpretation of the Bureau's reports. (See also W79-00191) (Coan-NC) dams, and carriage facilities for canals, pipelines W79-00193

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WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX III-PROJECT DATA.

Bureau of Reclamation, Washington, DC.
Economics and Program Analysis Branch.
Federal Reclamation Projects, 381 p, Index, Appendix 3 of 3 plus Summary Volume (1976).

Descriptors: *Operating costs, *Maintenance costs, *Cost repayment, *Project feasibility, Costs, "Cost repayment, "Project feasibility, *Irrigation programs, Land productivity, Land resources, Water resources, Recreation, Agriculture, "Colorado River Storage, "Recreation areas, "Pick-Sloan Missouri Basin Program, Collections, Contributions, Colorado Development Fund, Accrued expenditures, Carriage facilities, Western United States.

This volume is one of 3 statistical appendices to the 70th annual report on water and land resources accomplishments of the Bureau of Reclamation. It provides a micro-level view of various aspects of active construction and completed Reclamation projects. The projects are located throughout the western half of the United States, with the Pick-Sloan Missouri Basin Program receiving close inspection. A glossary of critical terms is provided with their definitions so that the tables are easily interpreted. Each project is broken down into several schedules listing topics such as general data on location and history, cumulative financial data, cost allocations and ultimate repayment data, amounts of funds per irrigable acre, status of repayment contracts and data on recreational areas. Not all projects have completed data on the several schedules, and some contain only sparse information. (See also W79-00191) (Coan-NC) W79-00194

OF SULFUR DEFICIENCY ON WATER REGIME AND INTENSITY OF PEA AND WHEAT PHOTOSYNTHESIS, (IN RUS-

Krasnoyarsk State Univ. (USSR). For primary bibliographic entry see Field 21. W79-00200

EFFECT OF SOIL-INJECTED ETHYLENE ON SUGARBEET (BETA VULGARIS L.) YIELD PARAMETERS.

Arizona Univ. Tucson. Dept. of Plant Sciences. . J. Francl, R. E. Dennis, D. K. Parsons, and A.

Journal of the American Association of Sugarbet Technologists, Vol. 19, No. 4, p 331-336. 3 tab, 8 ref. OWRT A-034-ARIZ,(4), 14-31-0001-5003.

Descriptors: *Sugarbeets, *Ethylene, Sugar yield, *Crop production, Arizona.

The first field experiment was located in southeastern Arizona in 1974. Ethylene gas was injected into a furrow 20 cm below the soil surface, at a rate of 6.2 kg/ha. Each test plot consisted of a

W79-00099

s of net intric power operation, diversion , pipelines their physiof energy.
e history of
king funds
The source d is broken reimburse-ndix also ins requiring 191) (Coan-

ACCOM-APPENDIX igton, DC. nch. , Index, Ap-1976).

Maintenance feasibility, tivity, Land ion, Agriculcation areas, Collections, nt Fund, Ac-ties, Western

appendices to and resources eclamation. It Reclamation hroughout the iving close inns is provided bles are easily en down into ch as general ative financial acre, status of ted data on the in only sparse Coan-NC)

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Field 2I.

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on of Sugarbeet 31-336. 3 tab, 8 0001-5003.

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lene gas was in-the soil surface, ot consisted of a

row located 1, 5, 10, or 50 rows from the place of ethylene injection. The rows were 76 cm apart. Beets in the first experiment were mechanically harvested, weighed, and sampled to determine the sugar content. Sugar/ha was 16.5% higher in the row nearest the applied ethylene than in the row located 37.7 m from the place of application. Although not statistically different, this finding prompted further field experiments. In March of prompted further field experiments. In March of 1975, field experiments in central Arizona were initiated. The methodology used for these experiments closely followed that of the first field experiment. There were no significant differences at the 5% level among the ethylene treatments on beet weight, sugar percentage, or sugar/ha in any of these field tests because of high experimental variability. The results in this study were variable and thus do not support the conclusion that soil injections of ethylene can be used to increase yield of sugarbeets under the described conditions. Further research should be directed toward final fing the optimum rate and date of ethylene applicaing the optimum rate and date of ethylene applica-tion, and optimum soil and environmental conditions. W79-00296

IRRIGATION EFFICIENCY, A BIBLIOG-RAPHY, VOLUME 3. Department of the Interior, Washington, D. C., Office of Water Research and Technology.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-287 626, Price codes: A10 in paper copy, A01 in microfiche. Water Resources Scientific Information Center Report OWRT/WRSIC 78-202, June 1978, 99 p, 3

*Irrigation Bibliographies, Crop production, Co-op response, Irrigation practices, Trickle irrigation, Sprinkler irrigation, Salinity control, Water quali-

This report, containing 260 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volumes 1 and 2 (see W77-03168 and W73-09115) covers information announced in SWRA from October 1968 through September 1976. This volume covers the period from October 1976 through June 1, 1978. Author and subject indexes are included. W79-00307

SHUNT METERS WITH SEGMENTAL ORI-

FICES, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. J. F. Ruff.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 719-722, July-August 1978. 6 fig, 1 tab, 4 ref.

Descriptors: *Flow measurement, *Irrigation, *Pipe flow, *Instrumentation, Laboratory tests, Calibrations, Orifices, Flow, Measurement, Pipes, Irrigation systems, Engineering, Agricultural en-gineering, Hydraulics, Agriculture, *Shunt meters.

An inexpensive shunt meter to monitor irrigation flows was described. The meter was constructed using a segmental orifice, any household water meter, and standard piping. The discharge rating curves for several orifices with different dam heights that can be used in 20.32 cm and 26.04 cm (8 in and 10 in) pipes were presented. Using these curves and a simple manometer, the shunt meter can be field adjusted to give the desired coefficient relating the total volume of flow to the volume indicated by the shunt meter. (Sims-ISWS) W79-00335 WATER HARVESTING FOR AFFORESTA-TION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER, Research Inst. of Forests and Rangelands, Tehran

or primary bibliographic entry see Field 3B. W79-00474

WATER HARVESTING FOR AFFORESTA-TION: II. SURVIVAL AND GROWTH OF TREES, Research Inst. of Forests and Rangelands, Tehran

For primary bibliographic entry see Field 3B. W79-00475

CONTROL OF FURROW INFILTRATION BY

COMPACTION, Colorado State Univ., Fort Collins. Dept. of Agricultural and Chemical Engineering. M. Khalid, and J. L. Smith.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 654-657, July-August 1978. 10 fig, 2 tab, 3 ref.

Descriptors: *Furrows, *Furrow irrigation, *Soil compaction, *Infiltration rates, Compaction, Compacted soils, Infiltration, Equipment, Mechanical equipment, On-site investigations, Irrigation, Mechanical engineering, Agricultural engineering, Agriculture, Soil compactors.

Sandy soils are difficult to irrigate by surface methods due to their high infiltration rates. Using an impact furrow compactor, the infiltration rate was reduced 40% at the first irrigation. A crust, formed on the soil after the first irrigation, controlled the infiltration rate on subsequent irrigations. The same size of compacted and noncompacted furrows required approximately the same power. (Sims-ISWS) W79-00481

PIPE SIZES FROM MODIFIED MOODY DIA-

GRAM, Michigan Univ., Ann Arbor. Dept. of Applied Mechanics and Engineering Science.

Journal of the Hydraulics Division, Proceedings of American Society of Civil Engineers, Vol. 103, No. HY1, p 81-85, January 1977. 1 fig, 2 ref, 20

Descriptors: Hydraulics, Hydraulic design, *Irrigation design, Irrigation engineering, *Moody resistance diagram, *Pipe flow, Pipes, Pipelines, Dimensional analysis.

In the course of developing some instructional material, a simple procedure evolved to extend the useful information contained on the Moody Diagram. Concurrently, the essence of that work's results was published by Lai and Lee. Nevertheless, a different point of view had been adopted in the development which makes the final result useful, especially if one wishes to demonstrate the utility of dimensional analysis. (Skogerboe-Colorado State)
W79-00499

PROFILE ACCUMULATION OF FERTILIZER-DERIVED NITRATE AND TOTAL NITROGEN RECOVERY IN TWO LONG-TERM NITROGEN-RATE EXPERIMENTS WITH

CORN, Iowa Agricultural and Home Economics Experiment Station, Ames. For primary bibliographic entry see Field 2G.

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF.
Heritage Conservation and Recreation Service,

Washington, DC. For primary bibliographic entry see Field 6E.

APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC PLANNING, ECOsystems International, Inc., Gambrills, MD. For primary bibliographic entry see Field 7B.

FIELD INVESTIGATION OF SELECTIVE WITHDRAWAL,
California Univ., Berkeley. Dept. of Mechanical

California Univ., Berkeiey, Dept. of Mechanical Engineering. G. Ivey, and J. Imberger. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No. HY9, Proceedings Paper 14029, p 1225-1237, September 1978. 4 fig, 3 tab, 6 ref, 2 append.

Descriptors: *Reservoir operation, *On-site investigations, *Discharge(Water), *Stratification, *Australia, On-site data collections, On-site tests, Water properties, Water temperature, Dissolved oxygen, Conductivity, Analysis, Analytical techniques, Lakes, Reservoirs, Mixing, Foreign research, *Western Australia, *Wellington Reservoir(Western Australia), Selective withdrawal.

A field investigation of the steady-state thickness and extent of a withdrawal layer in a startified and extent of a withdrawai layer in a startified resevoir was reported. Existing theory indicated that, throughout the study period, the withdrawal layer was in a steady state in the regime governed by a balance between buoyancy and viscous forces. A natural salt tracer in the water enabled rorces. A natural sait tracer in the water enabled estimates of the mean withdrawal layer thickness over a 10-km (6.2-mile) length upstream from the sak for two different time periods. To achieve good agreement between theoretical predictions and field measurements, it was necessary to postu-late transport coefficients of momentum approximately 10 times the molecular value. Comparisons with model simulations over the same time period suggested an effective average Prandtl number of 20 in the hypolimnion. (Humphreys-ISWS) W79-00119

AN ESTIMATE OF ANNUAL EUNOFF FROM ENGLAND AND WALES, 1728-1976, Department of the Environment, Reading (England). Water Data Unit. For primary bibliographic entry see Field 2E. W79-00124

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY, Kentucky Water Resources Research Inst., Lexington. For primary bibliographic entry see Field 6B. W79-00142

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975. SUMMARY REPORT. Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F.

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX

Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F.

AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES. Bureau of Reclamation, Washington, Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F.

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX III--PROJECT DATA.

Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F.

SUMMARY OF STUDY FINDINGS, PHASE I SUMMARY OF STUDY FINDINGS, PHAS REPORT: ECOLOGICAL EFFECTS HIGHWAY CONSTRUCTION U MICHIGAN WOODLOTS AND WETLANDS, Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 4C. W79-00195

CONTROL OF AQUATIC WEED BY MOTH

Central Inland Fisheries Research Inst., Cuttack (India). Fisheries Research Station. H. Chaudhuri, and K. Janaki Ram. Nature, Vol. 253, No. 5486, p 40-41, January 3,

*Biocontrol, *Aquatic Descriptors: weeds. *Insects, *Larvae, Floating plants, Fisheries, Wetlands, Aquatic plants, India.

Larvae of the moth, Erastroides curvifascia Hampson, feed specifically on foliar and stem por-tions of Pistia stratiotes, a common noxious floating weed. The moths breed readily in the laboratory and can be transferred in situ to host plants with comparative ease. (Stihler-Mass)

CATTAILS (TYPHA SPP.)--WEED PROBLEM

OR POTENTIAL CROP., Miami Univ., Coral Gables, FL. For primary bibliographic entry see Field 2I. W79-00198

OVERGROWING OF THE KARA KUM CANAL AND SOME AFTEREFFECTS OF INTRODUC-ING THE WHITE AMUR INTO WATER BODDIES, (IN RUSSIAN), Akademiya Nauk Turkmenskoi SSR, Ashkhabad.

Inst. Botaniki. Sh. I. Kogan.

Gidrobiol Zh 10(2), p 110-115, 1974.

Descriptors: *Aquatic weed control, Aftereffects, Canals, *Ctenopharyngodon idella, *Kara-Kum Canal, *Microcystis aeruginosa, *Reservoirs, *White amur. USSR

Because of the absence of submersed plants, the white amur (Ctenopharyngodon idella) is deprived of a food base in the Kara-Kum Canal (USSR) and it is assumed that its number in the canal in recent years is insignificant. The number of white amur in catches from the canal and water bodies con-nected with it is steadily declining. There are a number of reservoirs on the Kara-Kum canal and here the role of the white amur as a biometiorator

is apparent. The increase of the abundance and biomass of phytoplankton in 2 reservoirs occurred because of Microcystis aeruginosa, an undesirable organism. Apparently collector-drainage canals are the only type of water body in which the white amur can be used without restriction for weed con-trol. Copyright 1977, Biological Abstracts, Inc. W79-00207

LOW-FLOW CHARACTERISTICS OF OKLAHOMA STREAMS, Geological Survey, Oklahoma City, OK. Water Resources Div. For primary bibliographic entry see Field 2E. W79-00257

LOW-FLOW CHARACTERISTICS OF STREAMS ON THE OLYMPIC PENINSULA, WASHINGTON. Tacoma, WA. Survey. Resources Div. For primary bibliographic entry see Field 2E. -00258

MODEL OF THE FLOODING CAUSED BY THE FAILURE OF THE LAUREL RUN RESERVOIR
DAM, JULY 19-20, 1977, NEAR JOHNSTOWN,
PENNSYLVANIA,
Geological Survey, Harrisburg, PA. Water Resources Div. For primary bibliographic entry see Field 2E. W79-00263

THE HISTORIC LEVEL OF GREAT SALT LAKE, UTAH. Geological Survey, Salt Lake City, UT., Water Resources Div. For primary bibliographic entry see Field 2H. W79-00264

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER Geological Survey, Harrisburg, PA. Water Resources Div. For primary bibliographic entry see Field 7C. W79-00265

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN. Geological Survey, Harrisburg, PA. Water For primary bibliographic entry see Field 7C. W79-00266 Resources Div.

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1977. Survey, Madison, WI. Water Resources Div. For primary bibliographic entry see Field 7C. W79-00267

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977-VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS. Resources Div. For primary bibliographic entry see Field 7C. W79-00268

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CON-DITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977, Geological Survey, Tallahassee, FL. Resources Div.

A. Buono, K. W. Causseaux, and J. E. Moore. Open-file report 78-331, May 1978. 88 p. 45 fig.

Descriptors: "Water resources, "Projects, "Publications, "Abstracts, "Bibliographies, Groundwater, Surface waters, Water quality, Streamflow, Water supply, Water utilization, Water resources development, Reviews, "Florida, Southwest Florida.

This report summarizes the activities of the Southwest Florida Subdistrict of the U.S. Geological Survey, Water Resources Division for fiscal year 1977. The organization and mission of the subdistrict office are described. The cooperative program for fiscal year 1977 included 41 interpretive investigations. Abstracts of twenty reports released by the subdistrict during 1977 and an extensive bibliography of reports released from 1933 to 1977 are included. The hydrologic setting of southwest Florida is outlined followed by discussions of surface-water, ground-water, and quality-of-water conditions. Hydrologic conditions in southwest Florida in 1977 are shown by the southwest Florida in 1977 are shown by the presentation of hydrographs from selected sur-face-water, ground-water, and lake-stage data col-

HIGH-FLOW FREQUENCIES FOR SELECTED STREAMS IN OKLAHOMA, Geological Survey, Oklahoma City, OK Water Resources Div. For primary bibliographic entry see Field 2E. W79-00273

FLOOD REGIONS IN JAMAICA, Calgary Univ., Alberta. Dept. of Geography. For primary bibliographic entry see Field 2E. w79-0033

SIMULATION OF FLOWS IN UNGAGED Severn-Trent Water Authority, Birmingham (England). For primary bibliographic entry see Field 2E. W79-00331

STOCHASTIC PROCESSES RESOURCES ENGINEERING. Lund Inst. of Tech. (Sweden). Dept. of Water Resources Engineering.
For primary bibliographic entry see Field 8B. W79-00380

STORMWATER MODELING, Tennessee Univ., Knoxville, Dept. of Civil Engineering. For primary bibliographic entry see Field 5B. -00381

LAKE LEVEL CONTROL AND MANAGE-MENT -- A CASE STUDY,
Barr Engineering Co., Minneapolis, MN. I. Yomtovian. Water Resources Bulletin, Vol. 14, No. 5, p 1176-1186, October 1978. 3 fig, 2 tab, 4 ref.

Descriptors: *Water resources, *Alternative planning, *Flood control, *Lake management, Hydrology, Flood damage, Lake level, Exceedence probabilities, Decision making, Methodology, Cost-effectiveness, Chicago Chain of Lakes(Minn), Minnesota.

The frequent high water levels in the Chicago Chain of Lakes, located in east-central Minnesota, have caused extensive flood damages. Recent floods raised the concern of the local property owners, and they pressured the Chisago owners, and they pressured the Chisago County Board of Managers to initiate a study of alterna-tive lake control levels. A study was accomplished to identify potential flood control alternatives, screen out the most promising feasible alterna-tives, and recommend the most cost-effective

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WATER QUANTITY MANAGEMENT AND CONTROL Field 4 Control Of Water On The Surface—Group 4A

flood control measure. Several flood control alternatives were considered—eight of them were analyzed and evaluated in detail. A statistical method was used to estimate the expected annual flood damages under existing and future conditions. The effect of all proposed control measures on the annual flood damage reductions (benefits) were determined. Detailed benefit/cost analyses were carried out to evaluate the economic feasi-bility of alternatives. The effect of potential flood control measures on the environment was also stu-died. The economic analysis of the most cost-effective alternative did not strongly support artifi-cial lake level control; therefore the decision-making authorities were even more firm in their posi-tion to maintain the present condition and chose the Null Alternative as the most suitable alternative. (Bell-Cornell) W79-00390

OPTIMAL OPERATION OF SHELBYVILLE AND CARLYLE LAKES,

Illinois State Water Survey, Urbana. K. P. Singh.

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Water Resources Bulletin, Vol. 14, No. 5, p 1201-1219, October 1978. 4 fig. 3 tab. 9 ref.

Descriptors: *Reservoir operation, *Flood control, *Simulation analysis, *Multiple-purpose reservoirs, *Evaluation, *Operating rules, *Optimization, Recreation, Crops, Model studies, Economic efficiency, Lakes, Dams, Rivers, Illinois, Dynamic programming, Computer programs, Reservoir releases, Joint operation, Damage minimization, Benefit maximization, Systems analysis.

Dams were built by the U.S. Army Corps of En-gineers on the Kaskaskia River at Shelbyville and Carlyle in Illinois in 1969 and 1967 respectively. Operation of the Shelbyville and Carlyle Lakes has changed over the years due to considerably lower bankfull channel capacities downstream of the dams than were adopted in the project designs. This study was conducted to review the present operation policy. The intent was to derive a policy for maximizing the overall benefits (or minimizing the overall damages) and to compare these benefits or damages with those of the present pol-icy. The operating rules were optimized through a simulation model which was structured considering the physical nature of the system and the desirable operation in the best interest of various beneficial uses. The expected annual value of overall benefits from recreation and agriculture is soveral benefits from recreation and agriculture is shown to increase by \$0.2 million with the optimal policy. With the optimal joint operation, the overall damages are reduced by 76 percent on the average over the 24 years of flow record at Shel-byville and Carlyle. (Bell-Cornell)

THE APPLICATION OF LINEAR PRO-GRAMMING TO RUN-OFF MANAGEMENT, National Inst. of Agricultural Engineering, Silsoe

(England).
M. F. Potter, R. P. C. Morgan, and D. H. Noble.
Journal of Environmental Management, Vol. 6,
No. 1, p 43-55, January 1978. 4 tab, 30 ref.

Descriptors: *Watershed management, *Linear programming, *Runoff, *Land use, *Hydrology, Optimization, Planning, Constraints, Evaluation, Equations, Operations research, Runoff minimiza-tion, Sensitivity analysis, Economic considera-tions.

The following linear programming model is presented and solved for the purpose of con-rolling runoff by land use management in small stachments: minimize Z = (sum from c = 1 to c = b)(sum from i = 1 to i = m)(sum from t = 1 to t = To I of a miles in the individual from to the constraint of the children of th under the ith land use activity in the tth time period. The model is demonstrated with con-straints placed on the total area of each land unit, prescribed areas for selected land use activities, continuity (where appropriate) of land use activities over several time periods, and available resources of labor and capital (optional). (Bell-Cornell) W79-00393

RECLAMATION OF MEADOW-CHERNOZEM SOLONETZES OF THE KUSTANAI OBLAST.

(IN RUSSIAN), Akademiya Nauk SSSR, Moscow. Pochvennyi Inst.

For primary bibliographic entry see Field 2G. W79-00395

POSSIBLE USE OF POLYMERIC MATERIALS FOR FORTIFICATION OF DRAINAGE FILLS

FOR FORTIFICATION OF DRAINAGE FILLS (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Soil Physics and Reclamation. A. I. Mosolova, and V. F. Utkaeva. Biol Nauki (Mosc) 19(9), p 116-122, 1976.

Descriptors: *Polymers, Polymeric materials, Acetate, Acrylamide, Acrylic-acid, Acrylonitrile, Alcohol, Carbamide, Ethanol, Hypan, K-4, K-9, Loam, Podzolic soils, Pyrrolidone, Sandy soils, Sod, Stability, USSR, Water glass.

A series of polymeric preparations were used to artificially fortify sod-podzolic sandy loam on carbonate loam morraine and sandy soil of the Katinin oblast (Russian SFSR, USSR). The polymers increased water stability by 2-5 times. The polymers used were K-4, K-9, Hypan, polyacrylamide, polyvinyl alcohol, polyoxyethanol, water glass with acrylic acid, a copolymer from vinylpyrrolidone and acrylonitrile, a copolymer from vinylpyrrolidone, acrylic acid and carbamide, acrylic acid and ammonium carbonate and a preparation made of acrylic acid and vinylacetate.—Copyright 1978, Biological Abstracts, Inc. W79-00439

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT, Tennessee Univ., Knoxville. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 5G. W79-00447

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS, Virginia Polytechnic Institute and State Universi-ty, Blacksburg, VA. Agricultural Engineering De-

partment.
For primary bibliographic entry see Field 4C.
W79-00450

OPERATING MODEL FOR THE GREEN RIVER BASIN RESERVOIR SYSTEM, Purdue Univ., Lafayette, IN. School of Civil En-

gineering. C. Rukvichai.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 119, Price codes: A12 in paper copy, A01 in microfiche. PhD Dissertation. 1977. 255 p, 58 fig, 21 tab, 72 ref, 9 append. OWRT A-026-IND(6), B-094-IND(1).

Descriptors: *Reservoir operation, *Reservoir management, Competing uses, Reservoir releases, Routing, Reservoir storage, Model studies, *Kentucky, *Green River Basin(KY).

This study was concerned with the operation of the four reservoirs of the Green River Basin in

Kentucky. This reservoir system is regulated by the Corps of Engineers. The purpose was to gain some insight of the current practices in regulating the reservoir system and identify the systematic experimental determinants such that an algorithm could be developed. A longer range goal was to have the Corps adopt the system and then take up the question of an optimal operation. An operating model called GRBOPM was constructed using a daily simulation model which is in the form of a computer routine package. The model has three main components, namely the reservoir routing component, RESROUT: the stream flow routine component. RESROUT: component, RESROUT; the stream flow routing component, RESROUT; the stream flow routing component, GRBSYS; and the operating policy component, POLICY. The on-line use of GR-BOPM was studied to assist in the regulation of the reservoir system in real time. Two simulation runs for the on-line use were performed in the 'forecasting mode' and in the 'analysis mode'. The results were compared with historical data. (Wiersma-Purdue) (Wiersma-Purdue) W79-00452

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES, New Hampshire Univ., Durham. For primary bibliographic entry see Field 4C. W79-00460

AGRICULTURAL AND HYDROLOGICAL AP-PLICATIONS OF RADAR: FINAL REPORT, Kansas Univ. Space Technology Center, Lawrence. Remote Sensing Lab. For primary bibliographic entry see Field 7B. W79-00464

WATER HARVESTING FOR AFFORESTA-TION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,

Research Inst. of Forests and Rangelands, Tehran For primary bibliographic entry see Field 3B. W79-00474

WATER HARVESTING FOR AFFORESTA-TION: II. SURVIVAL AND GROWTH OF Research Inst. of Forests and Rangelands, Tehran

For primary bibliographic entry see Field 3B. W79-00475

TOTAL PHOSPHORUS TRANSPORT DURING STORM EVENTS, West Virginia Univ., Morgantown. Dept. of Chemical Engineering.
For primary bibliographic entry see Field 5B.
W79-00478

SAMPLER ACTIVATION RECORDING SYSTEM, North Carolina State Univ. at Raleigh. Dept. of For primary bibliographic entry see Field 7B.
W79-00480

CONTROL OF WATER RESIDENCE TIME IN SMALL RESERVOIRS,
Agricultural Research Service, Oxford, MS. Sedi-

Agricultural Research Service, CALONG, M.S. Schiebe, and F. E. Dendy.

F. R. Schiebe, and F. E. Dendy.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 666-670, July-August 1978. 8 fig., 1 tab, 6 ref.

Descriptors: "Reservoirs, "Suspended solids, *Reservoir operation, "Model studies, Laboratory tests, Hydraulic models, Dye releases, Inflow, Discharge(Water), Mixing, Water circulation, Analytical techniques, Sediments, Sediment Con-trol, Lakes, Limnology, "Residence time, Small reservoirs.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

A small laboratory reservoir was used to investigate the water residence time in various density stratification and selective withdrawal situations. Dyed reservoir water was diluted by clear, temperature-controlled, inflowing water. The experimental results were analyzed in terms of two simple analytical models. Conditions required for minimum and maximum mixing of the inflowing water, maximum storage of the inflowing water, and maximum bypass of the inflowing water were investigated. All four conditions were successfully produced in the experimental reservoir. The results indicated that natural stratification, along with a selective withdrawal system, can either maximize or minimize the water residence characteristics of an impoundment. Thus, time available for sediment settling can be changed by manipulating the location of the withdrawal structure in the reservoir. (Sims-ISWS)

SEEPAGE CONTROL BY PARTICLE SIZE

Science and Education Administration, Temple,
TX. Grassland-Forage Research Center.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 691-695, July-August 1978. 9 fig, 1 tab, 12 ref.

Descriptors: *Linings, *Clays, *Gravels, *Aggregates, *Seepage control, Canal linings, Reservoirs, Canals, Hydraulic conductivity, Permeability, Soils, Sands, Seepage, Pores, Porosity, Particle size, Soil water, Soil water movement.

Earth linings are used frequently in reservoirs, canals, and other earth structures to control liquid movement for the purposes of pollution control, water conservation, and structural stability. Clays or chemicals often are added to linings to reduce the hydraulic conductivity of the native soil; however, both additives sometimes decrease in effectiveness with time. Under ordinary conditions, gravel is nearly inert and does not change properties with time. The hydraulic conductivity of permeable soil was reduced substantially by adding gravel that was at least 15 times larger than the particle size of the soil. The amount of clay required to control seepage was reduced by half by the addition of gravel. (Sims-ISWS)

POTENTIAL AND LIMITATIONS OF RAIN-FALL-RUNOFF MODELS FOR PREDICTION ON UNGAUGED CATCHMENTS: A CASE STUDY FROM THE PAPUA NEW GUINEA HIGHLANDS, Papua New Guinea Univ., Port Moresby (New

Guinea). Dept. of Geography. For primary bibliographic entry see Field 2A. W79-00491

4B. Groundwater Management

GEOLOGIC STUDIES TO IDENTIFY THE SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT, Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W79-00018

ENERGY CONVERSION SYSTEM,

E. H. Schwartzman. U.S. Patert No. 4,084,379, 15 p, 10 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 834-835, April 18, 1978.

Descriptors: *Patents, *Geothermal studies, *Thermal conductivity, *Heat transfer, Energy

conversion, Energy transfer, Gases, Electrical power production, Working fluid.

The most abundant type of geothermal energy consists of a hot thermally heated fluid usually saturated with many dissolved solids such as silica, dissolved calcium, calcium oxide, carbonates, ad various other soluble salts, the most common being sodium chloride. A simple direct contact energy exchange is provided in such a manner as to prevent any of the liquids employed, which may contain solutes, from coming into contact with any surfaces of the components used in the system. A working fluid, which is immiscible in water and which has the desired thermodynamic properties, is used to absorb energy from the fluid source by direct heat transfer. This exchange of energy is accomplished by the complete vaporization of the working fluid and a small portion of the liquid fluid source. The composition of the produced vapor is controlled by the given temperature and pressure at which the process takes place and in turn is dependent on the thermodynamic properties of the working fluid employed and the flow rate of both the working fluid and the energy source fluid. The resulting vapor mixture is then utilized directly by expansion through a power producing device such as a turbine to produce power. (Sinha-OEIS)

PROCESS AND SYSTEM FOR RECOVERY OF ENERGY FROM GEOTHERMAL BRINES AND OTHER WATER CONTAINING SOURCES BY DIRECT CONTACT WITH A WORKING FLUID BELOW THE CRITICAL PRESSURE,

Occidental Petroleum Corp., Los Angeles, CA. (Assignee).

(Assignee). S. G. Woinsky.

U.S. Patent No. 4,089,175, 13 p, 6 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No. 3, p 832, May 16, 1978.

Descriptors: *Patents, *Geothermal studies, *Heated water, *Heat transfer, Heat exchangers, Temperature, Pressure, Condensation, Brines, Electric power production, Thermal powerplants, Working fluid.

A process and system are described for recovering energy from geothermal brines and other water containing or hot water sources such as ground waters heated by solar energy or other means, the energy being recovered from the brine or hot water using a working fluid such as a hydrocarbon, e.g. n-butane. The working fluid is heated in a direct contact heat transfer column. The heated working fluid is passed through an expander to product work, which is used to generate electricity or drive equipment. The working fluid is then con-densed in a cooler. Condensed working fluid, water and uncondensed gas are separated in an ac-cumulator. The cool liquid working fluid is pumped from the accumulator to the heat transfer column to be heated and carried through the cycle repeatedly. Cooled brine or water which heated the working fluid exits from the bottom of the column which acts as a liquid-liquid separator to minimize entrainment of the working fluid. This cooled brine or water is mixed with water separated from the working fluid in the accumulator, and is flashed at a pressure lower than that in the accumulator to flash of entrained and dissolved working fluid. The flashed working fluid is then compressed and fed to the cooler at the discharge from the expander and is thus recovered. An important feature residues in operating the heat transfer column so that the top of the column is in the subcritical the column is in the subcritical pressure region of the working fluid close to or approaching the apex of the saturated vapor curve on the Moller diagram for such fluid. (Sinha-OEIS) W79-00049

ELECTRICAL-RESISTIVITY SURVEYS FOR GROUNDWATER IN THE DECCAN TRAP

COUNTRY OF SANGLI DISTRICT, MAHARASHTRA, Geological Survey of India, Hyderabad. R. N. Bose, and T. S. Ramakrishna. Journal of Hydrology, Vol. 38, No. 3/4, p 209-221, August 1978. 7 fig., 4 ref. R. M

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Descriptors: *Groundwater, *Electrical conductance, *Surveys, *Water wells, On-site investigations, Droughts, Foreign countries, Water supply, Foreign research, Water yield, Wells, Shallow wells, Flow rates, Potable water, Hydrogeology, *India.

The results are presented of electrical-resistivity surveys carried out to guide the shallow tubewell drilling program aimed at alleviating the drinking water scarcity in the drought-stricken villages in parts of Sangli District, Maharashtra. The result showed that a combination of resistivity sounding and profiling is more effective in tackling problems for the location of wells in the Deccan trap country. The indispensability of resistivity profiling for detecting a shallow source of groundwater in fractured/fissured zones in basaltic traps was highlighted. (Sims-ISWS)

ON THE TWO-DIMENSIONAL GROUND-WATER MOVEMENT, Thessaloniki Univ., Salonika (Greece). Faculty of Technology. For primary bibliographic entry see Field 2F. W79-00108

DIGITAL MODEL STUDIES OF UNSTEADYSTATE RADIAL FLOW TO PARTIALLY
PENETRATING WELLS IN UNCONFINED
ANISOTROPIC AQUIFERS,
Indian Inst. of Tech. Kanpur. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2F.
W79-00111

INFLUENCE OF STRIP MINES ON REGIONAL GROUND-WATER FLOW, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W79-00118

KRIGING IN THE HYDROSCIENCES, Ecole Nationale Superieure des Mines de Paris, Fontainebleau (France). Center for Geological Information. For primary bibliographic entry see Field 2F. W79-00134

TYPE-CURVE ANALYSIS OF TIME-DRAW-DOWN DATA FOR PARTIALLY PENETRAT-ING WELLS IN UNCONFINED ANISOTROPIC AQUIFERS, Indian Inst. of Tech. Kanpur. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 2F. W79-00136

WATER ANALYTICAL DATA AS A TOOL IN DRILLING AND PRODUCTION ECONOMICS, For primary bibliographic entry see Field 8G. W79-00168

OIL-TROUBLED WATER,
American Ground Water Consultants, Albuquerque, NM.
For primary bibliographic entry see Field 5B.
W79-00169

CONJUNCTIVE USE OF GROUND AND SURFACE WATER, Infotech, Tehran (Iran). DISTRICT,

, p 209-221,

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Consultants, ee Field 5B

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R. Maknoon, and S. J. Burges. Journal of the American Water Works Associa-tion, Vol. 70, No. 8, p 419-424. 1 fig, 1 tab, 25 ref.

Descriptors: *Conjunctive use, *Water manage-ment(Applied), *Systems analysis, Optimum development plans, Groundwater, Surface water, Surface-groundwater relationships, Mathematical models, Water resources development.

Guidelines are presented for using a systematic approach in future analyses of conjunctive ground-surface water systems. The history of the development of analytical techniques for conjunctive use systems over the past 25 years is summarized and the physical, social, legal, and economic factors that interact in conjunctive use systems are identified and discussed. Steps required in systematic analysis of conjunctive use systems. mentined and discussed. Steps required in syste-matic analysis of conjunctive use systems are: (1) defining the nature, level, and scale of the problem, (2) analyzing the problem by identifying and defining the analysis objectives, significant variables, data availability, constraints, and alter-native solutions; (3) modeling of appropriate alternative solutions; (3) modeling of appropriate anter-natives that respond to system objectives; and (4) implementing the chosen optimal policy by setting up a system management structure, developing feedback mechanisms, an information system, and a data-gathering network. Low-cost analyses of conjunctive use systems may be possible only when considerable management latitude is availa-ble. However, it is unlikely that large expenditure ble. However, it is unlikely that large expenditure on extremely sophisticated modeling efforts will yield management practices vastly improved over those obtainable through less expensive analyses. Situations where data are limited or very costly may require the use of coarser spatial and temporal scales. This, in turn, means that the policy implemented will be conservative. (Purdin-NWWA) W79-00170

NO WATER-SOURCE DAMAGE FOUND IN OIL STATES.
For primary bibliographic entry see Field 5G.

W79-00172

REGIONAL GEOLOGY SERIES: PART VII, THE COLORADO PLATEAU, National Water Well Association, Worthington, OH.

For primary bibliographic entry see Field 8B. W79-00177

HOUSING PROJECT TO UTILIZE GROUND For primary bibliographic entry see Field 8C. W79-00178

NEW APPROACH GETS RESULTS IN UTAH WELL, Indian Health Service, Phoenix, AZ. Office of En-

vironmental Health. For primary bibliographic entry see Field 8B. W79-00181

WELL POINT SYSTEMS. For primary bibliographic entry see Field 8C. W79-00182

WATER USAGE REQUIRES PLANNING, Universal Oil Products, Inc., Saint Paul, MN. Johnson Div. For primary bibliographic entry see Field 6D. W79-00183

GROUNDWATER PUMPING TECHNIQUES FOR EXCAVATIONS AND OTHER WORKS, For primary bibliographic entry see Field 8G. W79-00185

MAPS SHOWING WATER-LEVEL DECLINES, LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA, Geological Survey, Tucson, AZ. Water Resources Div.; and Bureau of Reclamation, Phoenix, AZ. Arizona Dept. of Transportation, Phoenix. For primary bibliographic entry see Field 7C. W79-00251

GROUNDWATER QUALITY ATLAS OF NEBRASKA, Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln. For primary bibliographic entry see Field 7C. W79-00252

GROUND-WATER DATA, 1974-76, INDIAN WELLS VALLEY, KERN, INYO, AND SAN BERNARDINO COUNTIES, CALIFORNIA, Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 7C. W79-00253

HYDROGEOLOGIC RECONNAISSANCE OF THE MEKONG DELTA IN SOUTH VIETNAM AND CAMBODIA, Geological Survey, Hartford, CT. Water Resources Div. For primary bibliographic entry see Field 7C. W79-00255

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILU-

Geological Survey, Madison, WI. Water Resources Div. For primary bibliographic entry see Field 5B. W79-00256

GROUND-WATER LEVELS IN WYOMING, For primary bibliographic entry see Field 7C. W79-00259

GROUND-WATER AVAILABILITY IN THE HITCHCOCK-RED WILLOW, FRENCHMAN VALLEY, AND MEEKER-DRIFTWOOD IRRIGATION DISTRICTS, SOUTHWEST DISTRICTS, SOUTHWEST

NEBRASKA, Geological Survey, Lincoln, NE. Water Resources

E. G. Lappala, P. F. Hemphill, and R. E. Booker. Open-file report 78-461, 1978, 49 p, 20 fig, 3 tab, 10

Descriptors: *Surface-groundwater relationships, *Groundwater availability, *Supplemental irrigation, *Computer models, *Nebraska, Aquifer characteristics, Surface waters, Water demand, Water supply, Hydrologic data, Aquifer manage-ment, *Ogallal Formation, *Southwest Nebraska, Frenchman Creek, Republican River.

Surface-water supplies are diminishing in the Hayes-Red Willow and Frenchman Irrigation Dis-tricts in soutwest Nebraska. Stream depletions due to ground-water withdrawals upstream from Enders Reservoir have resulted in a shortage of about 8,700 acre-feet per year. The availability of ground water in two surficial aquifers was examined as a possible supplemental supply. The most produc-tive aquifer comprises alluvial deposits in the valleys of the Republican River and Frenchman Creek. The Ogallala Formation, which underlies the remainder of the area is a less productive aquifer except locally. Water levels have risen as much as 20 feet north of the Republican River and as much as 40 feet south of the river. Ground water inflow to the Republican River has in-

creased about 3 percent. A digital model of the aquifer system was used to assess the potential for providing supplemental supplies from two well configurations and from existing irrigation wells. The first well configuration could sustain a maxmum of 25 percent of the 1976 deficit with maximum stream depletions of 11 percent to Frenchman Creek and 60 percent to Blackwood Creek. The second well configuration could sustain 25 percent of the 1976 deficit with stream depeletions of less than 5 percent at the end of 19 years. Existing wells are adequate to irrigate district lands on which they are located for at least 19 years. W79-00260

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-00265

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN. Geological Survey, Harrisburg, PA. Water Resources Div.
For primary bibliographic entry see Field 7C.

WATER RESOURCES DATA FOR WISCONSIN. WATER YEAR 1977. Geological Survey, Madison, WI. Water Resources Div. For primary bibliographic entry see Field 7C. W79-00267

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS. Geological Survey, Harrisburg, PA. Resources Div. For primary bibliographic entry see Field 7C. W79-00268

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977, Geological Survey, Tallahassee, FL. Wate Resources Div. For primary bibliographic entry see Field 4A. W79-00272

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF CUSTER AND FREMONT COUNTIES, COLORADO,

Geological Survey, Denver, CO. Water Resources

C. J. Londquist, and R. K. Livingston. Water-Resources Investigations 78-1 (open-file report), February 1978. 56 p, 13 fig, 1 plate, 10 tab, 20 ref.

Descriptors: *Groundwater resources, *Surface waters, *Aquifer characteristics, *Hydrogeology, *Groundwater availability, Water yield, Irrigation, Water quality, Groundwater recharge, Surface-groundwater relationships, Reservoir storage, Water supply, *Colorado, Custer County, Fre-mont County.

The Wet Mountain Valley is an intermontane trough filled to a depth of at least 6,700 feet with unconsolidated deposits. Ground water occurs under both artesian and water-table conditions within the basin-fill aquifer and ground-water moverment is toward Grape and Texas Creeks.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

The depth to the water table is less than 10 feet in an area of about 40 square miles along the central part of the valley and is less than 100 feet in most of the remainder of the valley. Ground water stored in the upper 200 feet of saturated basin-fill sediments is estimated to total 1.5 million acrefect. Yields greater than 50 gallons per minute generally can be expected from wells in the central part of the basin-fill aquifer, and yields less than 50 gallons per minute are generally reported from wells around the edge of the basin-fill aquifer. Yields of wells in the mountainous areas are generally less than 20 gallons per minute. Most streamflow occurs as a result of snowmelt runoff during June and July. The long-term annual runoff at seven stations ranges from an estimated 0.02 cubic foot per second per square mile, generaly increasing with station altitude. Generalized annual water budgets for two areas in the Wet Mountain Valley indicate that surface-water out-The depth to the water table is less than 10 feet in Mountain Valley indicate that surface-water out-flow is only 7 to 11 percent of the total water supply from precipitation and other sources. The exapply from precipitation and other sources. In remaining water is lost to the atmosphere by evapotranspiration. The quality of both the surface and ground water is generally within the recommended limits for drinking water set by the U.S. Public Health Service. (Woodard-USGS) W79-00274

POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS
RIVER WATER MANAGEMENT DISTRICT
AND VICINITY, FLORIDA, SEPTEMBER, 1977,
Geological Survey, Orlando, FL. Water Resources

For primary bibliographic entry see Field 7C.

TRACING SEWAGE EFFLUENT RECHARGE -TUCSON, ARIZONA,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 5A. W79-00299

THE ISOTOPE HYDROLOGY OF THE MEREENIE SANDSTONE AQUIFER, ALICE SPRINGS, NORTHERN TERRITORY, AUS-

Australian Atomic Energy Commission, Lucas Heights, New South Wales (Australia). Isotope

For primary bibliographic entry see Field 2F. W79-00322

MANAGEMENT ASPECTS OF STORAGE OF WATER IN AQUIFER SYSTEMS, California State Dept. of Water Resources, Sacramento. Div. of Planning.

H. W. Greydanus. Water Resources Bulletin, Vol. 14, No. 2, p 477-480, April 1978.

Descriptors: *Aquifer systems, *Water management(Applied), *Water storage, Legal aspects, Water quality, Effects, Legislation, Environmental effects, Energy, Physical impacts, Existing rights, Equitable treatment, Cyclic storage.

Most of California's precipitation falls at the wrong place in the wrong season in relation to water needs. Redistribution and regulation are essential. Aquifer systems-groundwater basins--can provide a share of the future cyclic storage regulation. There are some differences in manager concepts in using a full basin in comparison with a partially dewatered basin. Legal water quality, and physical impacts on aquifer systems, including subsidence, are concerns. Legal water quality, and physical impacts on aquifer systems, including subsidence, are concerns. Storage may be for the benefit of overlying water users or for distant areas. Extraction during periods of dryness or

recharge methods will require careful planning. Existing rights and uses and equitable treatment of all parties must be assured. Financial compensation may be involved. Changes in methods of operation or degree of self-determination by affected waer agencies will require committed watermanship to resolve. Legislation or amendments to organic acts may be needed, but much can be accomplished within existing statutes. Environmental impacts which can be avoided by not can be accomplished within existing statutes. Environmental impacts which can be avoided by not using large surface storage sites are important. Energy for pumping will be a key consideration. About 40 percent of California is underlain by aquifer systems. This resource offers major potential in overcoming in maldistribution of natural water resources. (Bell-Cornell) W79-00386

HYDROGEOLOGY OF THE GRANDE PRAIRIE

AREA, ALBERTA, Research Council of Alberta, Edmonton. For primary bibliographic entry see Field 2F. W79-00470

FREE-SURFACE SEEPAGE PROBLEM, California Univ., Santa Barbara. Dept. of Mathe-For primary bibliographic entry see Field 8D.

4C. Effects On Water Of Man's Non-Water Activities

OUR RECLAMATION FUTURE: THE MISSING BET ON TREES, Southern Illinois Univ. at Carbondale, IL. Dept. of

Botany

W. C. Ashby, C. Kolar, M. L. Guerke, C. F.

Pursell, and J. Ashby. Illinois Institute for Environmental Quality, Docu-ment No. 78/04, January 1978. 85 p, 68 fig, 7 tab,

Descriptors: *Land reclamation, *Strip mining, *Forestry, *Forest management, *Illinois, *Reforestation, *Land management, Conservation, Soil erosion, Reclamation, Land use, Natural resources, Forests, Recreation, Hardwood, Wind erosion, Water erosion, Habitats, Wildlife conservation, Ecology, Environmental effects, Cultivation, Soil conservation, Erosion control, Legislation. Coniferous trees.

The use of tree planting in reclamation of surface-mined land in Illinois is examined. The history of reclamation in the State from the early tree plant-ing in the 1920's to the present is traced. This is followed by a description of factors involved in growing trees on surface-mined land, including species performance and planting recommenda-tions. Growth characteristics and performance records are discussed for a number of hardwood and conifer species. Consequences of forestation on the environment are extremely favorable. For example, trees act as filters to remove potentially toxic particles from the air, eliminate or reduce wind erosion and water erosion, and improve scenery. The recreational and educational uses of reclaimed surface-mined land are outlined and the predicted needs for recreational land is compared with the potential supply within Illinois. The social and economic effects of reclamation to forest land are discussed in general and also for some specific regions of the State, such as the Chicago area, Western Illinois, and Southern Illinois. A chapter on reclamation legislation and goals for the State is included. The Illinois reclamation laws effective from 1962 to 1975 are summarized. Also, included are a list of references, a reclamation directory giving names and addresses of State officials and reclamation managers, and a glossary of common and scientific names of plants mentioned in the re-port. (Majtenyi-IPA)

W79-00086

INFLUENCE OF STRIP MINES ON REGIONAL GROUND-WATER FLOW, Massachusetts inst. of Tech., Cambridge. Dept. of

R. Makesons, and S. J. Ber

Civil Engineering.
For primary bibliographic entry see Field 5G.
W79-00118

GRAZING AND LOGGING EFFECTS ON SOIL SURFACE CHANGES IN CENTRAL COLORADO'S PONDEROSA PINE TYPE, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Journal of Soil and Water Conservation, Vol 33, No 4, p 176-178, July-August 1978. 2 fig, 1 tab, 9

Descriptors: "Soil erosion, "Forest soils, "Lumbering, "Colorado, On-site investigations, Grazing, Vegetation effects, Measurement, Ponderosa pine trees, On-site tests, Methodology, Analysis, On-site data collections.

deasurements of soil surface elevation on ponderosa pine-bunch lands in central Colorado showed that 35 years of grazing and winter logging had not caused serious erosion. All measurements indicated an aggradation of soil surface material in relation to differences in ground cover, grazing, and timber removal. Aggradation on ungrazed areas exceeded aggradation on grazed or logged areas exceeded aggradation on grazed or logged areas by less than 7 millimeters. All logging was done when the soil was dry or frozen. Rubber-tired equipment was used for skidding and decking. As extensive permanent road system was not built. Instead, temporary roads with frequent log decks were used. Log butts were raised off the ground for skidding, and work was temporarily suspended whenever midwinter temperatures allowed the soil surface to thaw. (Humphreys-ISWS)

tion Service, Springfield, VA 22161 as PB-271 943, Price codes: A04 in paper copy, A01 in microfiche Journal Article Number 8208, 1975. 63 p.

Descriptors: *Wetlands, *Highway effects, *Forests, Highways, Road construction, Effects, Ecological distribution, Drainage effects, Marsh management, Water pollution sources, Chlorides, Michigan.

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The most important ecological effect on highway construction is the change of natural soil drainage conditions. Wetland sites are most affected Highway facilities may either raise or lower the groundwater table depending on culvert and drainage design. The sites where deep road cuts or fills were made experienced a change in water table levels near the edges of the roadway and increased evapotranspiration rates at the exposed creased evapotranspiration rates at the expose woodlot edges. The extent and duration of these altered drainage regimes is unknown. It is possible that they are just temporary and may be corrected with time by plant successions if adequate drain and channels have been provided. The vegetative species most sensitive to highway construction were conifers on the wetland sites. The growth of were conters on the wettand sites. The growth of hardwood species on wetland or upland sites wa either unaffected or significantly increased. Water contamination from highway use occurs, by recovery is fairly rapid. Downstream recovery usually occurs within 200 feet of the highway. In terchanges constitute the greatest threat to water quality, especially with respect to chloride concer-

WATER QUANTITY MANAGEMENT AND CONTROL Field 4 Watershed Protection—Group 4D

tration. This is apparently due to the drainage conveyance at these sites. (Steiner-Mass) W79-00195

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LAKE SUPERIOR REGULATION EFFECTS, National Oceanic and Atmospheric Administra-tion, Ann Arbor, Ml. Great Lakes Environmental Research Lab.

F. H. Quinn. Water Resources Bulletin, Vol. 14, No. 5, p 1129-1142, October 1978. 8 fig. 2 tab. 7 ref.

Descriptors: "Lake Superior, "Regulation, "Effects, "Great Lakes, "Mathematical models, Water resources development, Planning, Simulation analysis, Water levels, Outflow, Diversion, Equations, Systems analysis, Natural regime, Historical considerations, Hydrologic response.

The outflows of Lake Superior through the St. Marys River have been modified from natural conditions, initially by the construction of engineering works, such as bridges, and later by the construction of the state tion of control works and the regulation of the lake. For all practical purposes, the period from 1860 to 1887 represents the natural river condi-1860 to 1887 represents the natural river condi-tions. During the period 1888-1900, the regimen was modified by the construction of the Interna-tional Railroad Bridge and the Chandler-Dunbar Power Canal. In 1901, construction began on the compensating works. Following the completion of the compensating works in August 1921, the Lake Superior-outflows were regulated in accordance with the Orders of Approval, 26 and 27 May 1914. with the Orders of Approval, 20 and 27 may 171-A hydrologic response model was developed to simulate the natural Lake Superior regime. The model was run for the 1860-1975 period to simulate natural Lake Superior levels and outflows. The simulated levels were compared with the recorded levels to determine the effect of regulation. It was found that regulation has resulted in a rise in Lake Superior water levels. The simulated natural outflows for the period from 1937 to 1975 were run through the Great Lakes hydrologic response model to analyze the regulation effects on Lakes Michigan-Huron, St. Clair, and Erie. The results show no long-term bias due to regulation. (Bell-Cornell) W79-00388

CHANGES IN WATER REGIME OF BROWN FOREST SOILS OF THE GEORGIAN SSR UNDER THE EFFECT OF SILVICULTURAL PRACTICES, (IN RUSSIAN), Tiflis last. of Forestry (USSR).
T. F. Urushadze, and D. V. Lomidze.

Pochvovedenie (6), p 55-62, 1977.

Descriptors: *Forest soils, Georgian SSR, USSR, *Lumbering, Clear-cutting, Soil physical proper-ties, *Soil moisture, Seasons, Soil, Trees, Soil ero-sion, *Moisture deficit.

Soils in undisturbed forest plantations (Georgian SSR, USSR) are characterized by better water-physical roperties than soils on sites where logging took place. The loss of soil moisture begins in the 1st half of April; soil moisture accumulation, from the 2nd half of Nov. In summer, under high (tree) density areas, the formation of a thick dead horizon is observed, as compared to the low density sites. With increasing age and density of the tree stand, the loss of soil increases.—Copyright 1978, Biological Abstracts, Inc. W79-00401

BRUSHLAND WATERSHED FIRE MANAGE-MENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS, California Univ., Berkeley. Dept. of Forestry and

Conservation.
For primary bibliographic entry see Field 6B.
W79-00449

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS, Virginia Polytechnic Institute and State Universi-ty, Blacksburg, VA. Agricultural Engineering De-

partment.
B. B. Ross, V. O. Shanholtz, D. N. Contractor, and J. C. Carr.

and J. C. Carr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 170,
Price codes: A07 in paper copy, A01 in microfiche.
Virginia Water Resources Research Center Bulletin 85, October 1978. 137 p, 39 fig, 27 tab, 31 ref.
appendix from Center upon request. OWRT A077-VA(2).

Descriptors: *Watershed model, *Land-use model, *Finite element model, Flood flow routing, *Model studies, Storm water, Surface flow model-ing, Parametric model, Watershed subdivision.

A model was developed for predicting storm hydrographs by combining the components of a rainfall excess generator and a stormwater routing routine. The spatially responsive characteristics of this model structure were accomplished by assuming two basic discretization phases. The first phase focused on minimizing the aggregation of the dynamic, hydraulic storage properties in soils and surface conditions. Soils and land-use data defined surface conditions. Soils and land-use data defined homogeneous' response units; a parametric soil moisture algorithm generated rainfall excess for each unique response unit. Phase two considered the watershed's physiographical properties and developed a finite element structure to route rainfall excess downstream. The governing flow equations of continuity and momentum were solved by the finite element numerical technique. The finite element model structure can be used with input data at either a fine or coarse level of data resolution. Trader offs evist among such factors as comtion. Trade-offs exist among such factors as comtion. Trade-offs exist among such factors as com-puter costs, data acquisition, and accuracy. Results from applying the model to several watersheds with complex land uses were en-couraging. Comparisons with recorded discharge were made in the ungaged context; that is, the data base was created, streamflows were generated, and then were compared to recorded flows with no optimization. Several scenarios are included in the text, each illustrating the utility of the modeling concept for evaluating the utility of the modeling concept for evaluating the impact of land-use alternatives on flood flows. W79-00450

FACTORS AFFECTING THE QUALITY OF URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNES-

Tennessee Univ., Knoxville. Dept. of Civil En-

gineering. For primary bibliographic entry see Field 5B. W79-00456

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES, New Hampshire Univ., Durham.

J. A. Pickering.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 169, Price codes: A05 in paper copy, A01 in microfiche.

MS Thesis, May 1978. 81 p. 5 fig, 10 tab, 30 ref, append. OWRT A-038-NH(1), 14-31-0001-4029.

Descriptors: *Economic impact, Hydrologic aspect, Water quality, Economic development, Watershed management, Lakes, Land use, Lake shore development, Water quality, Phosphorus ac-cumulation, Economic-environmental trade-off, Mathematical programming.

Alternative development patterns, evaluated by their impacts on the lake area environment and area economy, included residential patterns, commercial patterns, and combinations of these two types. Economic impact from each alterative development was measured in terms of net public revenue and total private expenditures to the local

area, to the state and to other states. The impact of the alternative developments on the lake area environment was measured in terms of crowding levels and the level of phosphorus concentration in the lake. Crowding levels included lake surface use, public beach use and the total number of user days spent in the area. Phosphorus loading of the lake water was used as a proxy variable to reflect the changes in the lake water quality. Eleven development patterns were analyzed. The first pattern was a forested watershed which maximized the environmental quality through low phosphorus loading of the lake and no lake area crowding. Economic revenues accrued from property tax revenues of the undeveloped land holdings. The second alternative described the sample lake's current development status. From the analysis, to ensure good environmental quali-ty, reduce lake crowding and lake nutrient levels, as well as to maintain a given economic criterion, a combination of first tier residential and commercial development around the lake is suggested. Development should be planned to avoid over-crowding residential patterns. W79-00460

4D. Watershed Protection

OUR RECLAMATION FUTURE: THE MISSING BET ON TREES, Southern Illinois Univ. at Carbondale, IL. Dept. of

Botany. For primary bibliographic entry see Field 4C. W79-00086

SOIL. WATER AND AIR SCIENCES RESEARCH. Science and Education Administration, Washington, DC. For primary bibliographic entry see Field 2G. W79-00105

GRAZING AND LOGGING EFFECTS ON SOIL SURFACE CHANGES IN CENTRAL COLORADO'S PONDEROSA PINE TYPE, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. For primary bibliographic entry see Field 4C. W79-00140

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUN-TAINOUS BASIN,
British Columbia Univ., Vancouver. Dept. of

Geography.
For primary bibliographic entry see Field 5B.

W79-00332

HYDRAULIC MODEL INVESTIGATION OF A TWO-WAY DROP INLET FOR FLOODWATER RETARDING STRUCTURE NO. 3, BANKLICK CREEK WATERSHED, BOONE AND KENTON COUNTIES, KENTUCKY, Department of Agriculture, Minneapolis, MN.

Science and Education Administration.
For primary bibliographic entry see Field 8B. W79-00341

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTED FORESTED

WATERSHED, Kentucky University, Lexington, Water Resources Research Institute.
For primary bibliographic entry see Field 5B.
W79-00448

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4D-Watershed Protection

BRUSHLAND WATERSHED FIRE MANAGE-MENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS, California Univ., Berkeley. Dept. of Forestry and

Conservation For primary bibliographic entry see Field 6B. W79-00449

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

GEOLOGIC STUDIES TO IDENTIFY SOURCE FOR HIGH LEVELS OF RADIUM AND BARIUM IN ILLINOIS GROUND-WATER SUPPLIES: A PRELIMINARY REPORT,

Illinois State Geological Survey, Urbana; and Illinois State Water Survey, Urbana.

K. Cartwright, S. A. Specht, R. H. Gilkeson, and R. A. Griffin.

Available from the National Technical Informa-tion, Springfield, VA 22161 as PB-287 737, Price tion, Springiteid, VA 22101 as PB-28/73/, Price codes: A03 in paper copy, A01 in microfiche. University of Illinois, Water Resources Center, Urbana, Research Report No 135, (UILU-WRC-78-0135), August 1978. 27 p, 9 fig, 4 tab, 2 ref. OWRT A-084-ILL(1).

properties, Radioisotopes, Descriptors: *Chemical Radioactivity, Groundwater, Sediments, Solubility, Sulfates, Water supply, *Illinois, Geology, *Aquifer characteristics, Geology, *Aquifer characteristics, Barium, *Radium, Thorium, Uranium, *Illinois, Geology, *, Barite, *Barium, *Radi *Pollutant identification.

Analyses of water from municipal wells in Illinois by the Illinois Environmental Protection Agency showed that more than 300 wells exceeded the upper limit, 3 picocuries/liter (U.S. Public Health Service, 1962), for gross alpha radiation in drink-ing water. More than 30 wells exceeded the upper limit, 1 milligram/liter (U.S. Public Health Serv 1962), for barium in drinking water. High levels of radiation in ground water were more extensive in areal distribution than the high levels of barium. All of the affected wells were finished in bedrock, primarily in rocks of the Cambrian and Ordovician systems of northern Illinois. The geologic setting in which the high levels of radiation and barium were documented indicated that the problem was not restricted to Illinois. The source of the radia-tion in ground water was thought to be the natural occurrence of the radioactive elements uranium 238 and thorium-232 in the aquifer rocks. Analyses of a limited number of rock samples indicated that uranium and thorium concentrations were highest in fine-grained sediments in the aquifer system: hest concentration was in shales that confine the aguifer. The occurrence of natural radioisotopes in ground water was thought to be complex, involving source rocks, ground-water chemistry, and the hydraulic stress placed on the aquifer. Chemical analyses of rock samples indicated that high concentrations of barium were widespread in rocks of the Cambrian and Ordovician Systems. The concentration of barium in ground water was controlled by solubility equilibria reactions with sulfate ion. A map showing sulfate ion concentration in the Cambrian Ordovician Aquifer could be used to delimit regions where barium might occur at concentrations exceeding 1 milligram/liter. W79-00003

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS, Kansas Water Resources Research Inst., Manhat-

For primary bibliographic entry see Field 5B. W79-00006

DEVELOPMENT OF A MANOMETRIC FISH BIOASSAY TECHNIQUE FOR WATER POLLU-TION.

ssee Technological Univ., Cookeville. Dept. of Civil Engineering. D. R. Bledsoe.

D. R. Bledsoe. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-287 657, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, December 1977. 116 p, 20 fig, 54 tab, 27 ref, append. OWRT A-034-TENN(2).

Descriptors: *Bioassay, Fish populations, *Lethal limit, Toxicity limits, *Pollutant identification, Respiration rates, Goldfish, Rainbow trout, Carp, Channel catfish, *Tissue bioassay, *Bioassay

Static 96-hour in vitro bioassays were co to determine the median toxicity limit (TLm) of zinc sulfate, phenol, and isopropyl alcohol for common goldfish (Carassius auratus). Respiromet-ric in vivo bioassays were conducted utilizing the same three toxicants; liver tissue homogens from channel catfish (Ictalurus punctatus), rain-bow trout (Salmo gairdneri), and carp (Cyprinus carpio) were utilized as the bioassay test subjects. Oxygen utilization by the tissue homogenates sub-jected to various concentrations of toxicants was the recorded response. Comparisons between the two bioassay techniques revealed that the respirometric median toxicity limit (RTLm) was closely correlated to the TLm values for each of the toxicants studied. The RTLm was defined as the toxicant concentration at which the slope of the line of the oxygen utilization per gram of liver versus toxicant concer was equal to that of homogenate not subjected to a toxicant. (Bustamante-Tenn Tech) W79-00008

CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER.,

Illinois Univ. at the Medical Center, Chicag W. H. Hallenbeck, E. H. Chen, C. S. Hesse, K. Patel-Mandik, and A. H. Wolff.

Journal of the American Water Works Associa-tion, Vol. 70, No. 2, p 97-101, February 1978. 2 fig,

Descriptors: *Asbestos, *Potable water, *Electron microscopy, *Rain, Air pollution effects, Water pollution sources, *Pollutant identification, Samoling, *Chrysotile, *Carcinogenesis, Analysis,
Asbestos-cement pipe, *Lake Michigan, *Illinois.

To investigate the possibility that asbestos-cement pipe does, as has been suggested, release asbestos as a contaminant in drinking water, a study was made of water samples from fifteen public watersupply systems before and after their flow through asbestos-cement pipes of various ages, lengths, and diameters. Although several water systems contained moderately aggressive water, no statisti-cally significant release of chrysotile was observed. It may be possible, however, that chrysotile is released from pipes at levels below the detection limits used in this study or at levels that were obscured by laboratory contamination or by chrysotile already present in the water. 79-00013

DETERMINATION CHRYSOTILE OF ASBESTOS IN RAINWATER,

Illinois Univ. at the Medical Center, Chicago. C. S. Hesse, W. H. Hallenbeck, E. H. Chen, and G. R. Brenniman

Atmospheric Environment, Vol 11, p 1233-1237, 1977. 4 tab, 30 ref. OWRT A-071-ILL(6).

Descriptors: *Asbestos, *Electron microscopy, *Rain, Pollutant identification, Air pollution ef-fects, Water pollution sources, *Chrysotile, fects, Water pollution sources, *Ch *Carcinogenesis, Analysis, Chicago, *Illin

A feasibility study was undertaken in order to determine if chrysotile asbestos could be found in rainwater. Rainwater samples were collected at one Chicago and two suburban Chicago locations. The Chicago location was near a busy intersection and building construction. The two suburban sta-tions were located in residential areas. All three sites were within four blocks of a major expressway. None of the rainwater samples collected at the suburban sites contained levels of chrysotile which were significantly above laboratory con-tamination levels. All the rainwater samples from the Chicago location contained significant levels of chrysotile. This finding demonstrates a mechanism by which asbestos could be transferred from air to surface water.

AQUATIC BIOTAL MONITOR, Tereco Corp., College Station, TX. (Assignee). W. E. Pequegnat. U.S. Patent No. 4,084,343, 10 p, 12 fig, 9 ref; Offi-

cial Gazette of the United States Patent Office, Vol. 969, No. 3, p 890, April 18, 1978.

Descriptors: *Pollutant identification, *Patents, *Monitoring, *Water pollution effects, *On-site investigations, Biota, Water quality, Sampling,

An aquatic biotal monitor is disclosed for monitoran aquatic plotal monitor is disclosed for monitoring the chronic impact of pollution, such as chemical, thermal and turbidity, of aquatic environments upon in situ samples of biota. The monitorincludes a top and bottom mounting ring. A water permeable mesh extends between and interconsects the mounting. nects the mounting rings and enclosed the bottom ring to form a closed and cylindrical enclosure to ring to form a closed and cylindrical enclosure to retain the biotal sample. The cylindrical enclosure permits the free exchange of ambient water between the outside of the cylindrical enclosure and the inside of the enclosure. The monitor further includes flotation structure attached to the top ring for floating the enclosure in the body of water so that the enclosure monitors the impact of changing aquatic environments on the biotal sam-ple. In addition, the monitor can be anchored at a selected site for studying the impact over periods of time. (Sinha-OEIS)
W79-00033

REMOTE WATER MONITORING SYSTEM. National Aeronautics and Space Administration, Washington, DC. (Assignee).
For primary bibliographic entry see Field 7B.
W79-00047

AUTOMATIC SYSTEM REMOTE MONITOR, CLEANER FOR

J. D. Huty. U.S. Patent No. 4,088,575, 6 p, 5 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 636, May 9, 1978.

Descriptors: *Patents, *Monitoring, *Sampling, *Water treatment, *Water quality control, *Remote sensing, Slime, Algal poisoning, Equipment protection.

A problem commonly encountered, particularly in warm weather, is that continuing biological activi-ty occurring in water being sampled causes the sample which is monitored remotely to be not truly representative of the water at the instant the water was removed from the lake or stream. A further problem is that the continuing biological activity produces a biological slime which grows on all surfaces contacted by the water being sampled. Such disadvantages are removed by providing an auto-matically timed apparatus for periodically in-troducing a biological poison to the water being sampled immediately as the sample is being withdrawn from its source. The periodic introduction of the biological poison functions as a complete system protector to keep all exposed sur-

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants-Group 5A

faces throughout the monitoring system free of slime accumulations. Backwashing means are also provided to preserve the cleanliness of the mechanism which pumps the water being sampled to monitoring devices and operates to enhance the effectiveness of the monitoring and sampling devices. (Sinha-OEIS)

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QUANTITATIVE COMPARISON OF SEINING AND UNDERWATER OBSERVATION FOR STREAM PISHERY SURVEYS, Argonne Natonal Lab. IL. For primary bibliographic entry see Field 7B. W79-00072

CONTINUOUS STANDARD WATER DELIVERY SYSTEM FOR BIOASSAYS WITH AQUATIC ORGANISMS, Rijksinstituut voor Drinkwater-voorziening,

New York Control of the Control of t

Descriptors: *Bioassay, Methodology, Laboratory tests, Laboratory equipment, Water pollution effects, *Water quality, Monitoring, *Water chemistry, Water treatment, Waste treatment, *Water purification dosing apparatus.

The effects of pollutants on aquatic organisms can only be determined in a test water of acceptable quality. In this paper we describe a reliable auto-matic system which removes most of the undesirable contaminants from the water and adds the proper amounts of certain reconstituting chemicals for the production of uniform test water necessary for reliable and reproducible toxicity test results. (EIS-Katz) W79-00073

ARTIFICIAL SUBSTRATE SAMPLER FOR BENTHIC INVERTEBRATES IN PONDS, SMALL LAKES, AND RESERVOIRS, Tennessee Technological Univ., Cookville. Dept. For primary bibliographic entry see Field 7B.
W79-00074

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET, Feod and Drug Administration, Washington, DC. Div. of Chemistry and Physics.

A. P. Borsetti, and J. A. G. Roach. Bulletin of Environmental Contamination and Toxicology, Vol 20, p 241-247, 1978. 2 fig, 1 tab, 11

Descriptors: *Chlorinated hydrocarbon pesticides, Pesticide *Pesticide *Pesticides, Pesticide kinetics, Gas chromatography, Soil chemistry, Soil analysis, Chemical analysis, Organic compounds, Chemical properties, Chemical wastes, Industrial wastes, Persistence, *Kepone, *Tissue analysis.

The insecticide Kepone has been the subject of intensive residue analyses following recent environ-mental contamination from Kepone production in Hopewell, VA. The finding of Kepone homologs in soil and fish (mullet) reported here may suggest a possible pathway for the environmental degradaion of this highly persistent pesticide, and may indicate the presence of residue components in addition to Kepone per se that should be considered for inclusion in analyses. (EIS-Deal) W79-00080

A METHOD OF MEASURING BACTERIAL GROWTH IN AQUATIC ENVIRONMENTS USING DIALYSIS CULTURE, Texas Tech Univ., Lubbock. Dept. of Microbiolo-

gy. R. C. Baskett, and W. J. Lulves. J Fish Res Board Can. 31(3), p 372-374, 1974.

Descriptors: Aquatic environments, Bacterial growth, Brevibacterium sp. Culture, Dialysis, Environment, Farm ponds, "Growth rates, Nutrients, Ponds, Methodology, Measurement.

An inexpensive, easy-to-use method was developed for studying microbial growth and behavior in situ. Dialysis tubing suspended from a styrofoam flotation ring was filled with sterile distilled water, placed in a farm pond, and inoculated with Brevibacterium sp. The visible population within the tubing increased significantly within 96 h, indicating that nutrients in the pond water necessary for growth and multiplication of Brevibacterium sp. diffused through the dialysis membrane. Copyright 1974, Biological Abstracts, Inc.

ACID PRECIPITATION IN THE NETHER-

LANDS,
Department of Environmenta Control, Haarlem (Netherlands). A. J. Vermeulen.

A. J. vermetten. Environmenta Science and Technology, Vol. 12, No. 9, p 1016-1021, September 1978. 4 fig, 2 tab, 5

Descriptors: *Precipitation(Atmospheric), *Air pollution, *Europe, Sulfur compounds, Nitrogen compounds, Rain water, Acids, Pollutants, Foreign countries, Water quality, Air pollution ef-fects, *The Netherlands, Acid precipitation.

fects, *The Netherlands, Acid precipitation.

Various tests of the chemical composition of precipitation indicate that acids are present in larger quantities than would occur naturally. This phenomenon is attributed to ever increasing sulfur dioxide and nitrogen oxides air pollution. Around 1966, the highest acid precipitation measurements in the world (on a yearly basis) were made in The Netherlands. After 1967, the acid concentrations of rain decreased, simultaneously with a considerable reduction in SO2 emissions. The coming years in The Netherlands will be characterized by a decreasing use of natural gas and an increasing use of oil with this consequence: an increasing emission of SO2. Acid deposition may increase from an average of 140 mg/sq m (expressed as H(+)) in the year 1985 (with high extreme values of 300 mg/sq m) to an average of 370 mg/sq m in the year 2000 (with high extreme values of 700 mg/sq m). The natural background deposition would be about 1-3 mg/sq m per year. The total effects of such an acidification of precipitation cannot be predicted at present. (Humphreys-ISWS) W79-00138

CONTROLLING AND MONITORING ACTIVATED-SLUDGE UNITS,
Polybac Corp., New York.
For primary bibliographic entry see Field 5D.
W79-00160

WATER ANALYTICAL DATA AS A TOOL IN DRILLING AND PRODUCTION ECONOMICS, For primary bibliographic entry see Field 8G. W79-00168

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOUR-ISM. 2. BACTERIA AS AN INDEX OF WATER POLLUTION ON THE RYBI POTOK STREAM, Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod. For primary bibliographic entry see Field 5C. W79-00219

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.

Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Manage-For primary bibliographic entry see Field 5G. W79-00222

ION SELECTIVE ELECTRODES IN WATER QUALITY ANALYSIS, Municipal Environmental Research Lab., Cincinnati, OH. Water Supply Research Div. R. C. Thurnau.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 724, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/2-78-106, May 1978. 37 p, 18 fig, 10 tab, 54 ref.

Descriptors: "Pollutant identification, "Water analysis, "Water quality, "Ions, "Electrodes, "Specific ion electrode, "On-site laboratories, Sampling, Monitoring, Hydrogen ion concentration, Alkalinity, Calcium, Chloride, Fluoride, Water hardness, Nitrate.

A mobile water quality laboratory capable of monitoring 19 water quality parameters is described. Among the instruments included in this described. Among the instruments included in this laboratory, ion specific electrodes have shown great potential, especially for monitoring such parameters as alkalinity, calcium, chloride, fluoride, hardness, nitrate, and pH. The operating principle for all specific ion electrodes is based on creation of a classical concentration potential across a permeable membrane, that is, it follows the Nernst equation. The pH and chloride electhe Nernst equation. The pH and chloride electrodes were housed in a commercial unit and linked to the computer with a minimum number of operating problems. Other parameters required more development and required ionic strength or pH buffers to swamp out problems of activity and ionic strength. Test periods usually lasted about one week. The electrodes functioned quite well with accuracy comparable to statistics found in Standard Methods for the Examination of Water and Wastewater. (Maitenyi-IPA) and Wastewater. (Majtenyi-IPA) W79-00223

ASBESTOS - A BIBLIOGRAPHY, Environmental Research Lab.-Duluth, MN. J. H. Tucker, P. M. Cook, G. L. Phipps, G. N. Stokes, and P. H. Lima.

Available from the National Technical Informa-

tion Service, Springfield, VA 22161 as PB-286 486, Price codes: A05 in paper copy, A01 in microfiche. Report No EPA-600/3-78-066, July 1978, 92 p.

Descriptors: "Asbestos, "Bibliographies, "Air pol-lution, "Air pollution effects, Chemical properties, Physical properties, Toxicity, Environment, Biological properties.

The 1,425 references included in this bibliography are related to the chemical, physical, biological, and medical properties and effects of asbestos in the environment. The basic list was compiled from bibliographies supplied by A. Brown, Mayo Clinic, Rochester, MN; R. E. Shapiro, NIEHS, Silver Spring, MD; and J. R. Kramer, McMaster University, Hamilton, Ont., Canada. This was supplemented by handsearching Biological Abstracts and Chemical Abstracts 1966-1975 and by ASCA computer searches for the years 1973-1977. (Majtenyi IPA) W79-00225

ANALYSIS OF RADIOACTIVE CONTAMI-NANTS IN BY-PRODUCTS FROM COAL-FIRED POWER PLANT OPERATIONS, Environmental Monitoring and Support Lab., Cincinnati, OH. H. Krieger, and B. Jacobs.

Group 5A-Identification Of Pollutants

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 365, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/4-78-039, July 1978. 31 p. 7 fig, 3 tab, 13 ref, 1 append.

Descriptors: Pollutant identification, *Environmental pollution, *Air pollution, *Radioactive wastes, *Radioisotopes, *Electric powerplants, *Coals, Fossil fuels, Uranium, Radi-Thorium, *Radiochemical analysis, Radia-Public health, Fly ash, Scrubber sludge,

In addition to the sulfur and nitrogen oxides commonly associated with environmental discharges of coal-fired plants, significant concentrations of naturally radioactive contaminants are produced, including compounds of radium, thorium, and uranium. A study was conducted to identify and quantify the major radionuclides detected in fossil fuel powerplant discharges. Samples of coal, fly ash, bottom ash, and scrubber sludge were col-lected from different regions of the U.S. and analyzed for radium, thorium, and uranium. Stan-dard radiochemical procedures were modified to obtain reproducible results for the variety of samples analyzed. These can be used to calculate a radioactivity balance on the basis of normal plant operations. The spectrum of activity levels is tabulated in a variety of samples and compared with the results from non-destructive spectrometry and radiochemical separations. It is concluded that, for the present, the expanding fossil-fuel powerplant operations present no radiation hazard. Methods of analysis are described in the appendix. W79-00227

VELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969. Environmental Protection Agency, Kansas City,

MO. Region VII. Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 664, Price codes: A16 in paper copy, A01 in microfiche. December 1970, 352 p.

Descriptors: *Yellowstone National Park, *Soda Butte, *Water pollution, *Water quality, *Missouri River, *Yellowstone River, National Parks, Wyoming, Missouri, Montana, North Dakota, Organic loading, Basic data collections, Biochemical oxygen demand, Ammonia, Nitrates, Nitrogen, Sulfates, Water temperature.

Basic data from the Yellowstone National Park water quality survey of May-August 1970 and the Soda Butte survey of May-October 1969 are presented in tables; no text is included. Indicators monitored were water temperature, air temperature, streamflow, dissolved oxygen, pH, conductivity, turbidity, hardness, chloride, sulfate, BOD, ammonia, total Kjeldahl nitrogen, nitrite- and nitrate-nitrogen, orthophosphorus, calcium, sodi-um, potassium, fluoride, boron, copper, iron, manganese, zinc, selenium, radium-226, magnesium, barium, lead, cyanide, arsenic, phenols, residue, uranium, silica, total organic carbon, coliforms, fecal coliforms, and streptococci. Various rivers were monitored, including the Missouri and Yellowstone. (Lynch-Wisconsin)

GROUNDWATER QUALITY ATLAS OF NEBRASKA, Geological Survey, Lincoln, NE. Water Resources

Div.; and Nebraska Univ. Conservation and Survey Division, Lincoln.
For primary bibliographic entry see Field 7C.
W79-00252

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI, Geological Survey, Rollo, MO. Water Resources For primary bibliographic entry see Field 5B.

HYDROGEOLOGIC RECONNAISSANCE OF THE MEKONG DELTA IN SOUTH VIETNAM AND CAMBODIA, Survey, Hartford, CT. Water Geological Resources Div. For primary bibliographic entry see Field 7C. W79-00255

AUTOMATED DETERMINATION OF SELENI-UM IN WATER, Geological Survey, Denver, CO. Water Resources

G. Pyen, and M. Fishman.

Atomic Absorption Newsletter, Vol. 17, No. 2, p 47-48, March-April 1978. 1 fig. 2 tab. 3 ref.

Descriptors: *Water analysis, *Chemical analysis, *Trace elements, *Analytical techniques, *Laboratory tests, *Selenium, Atomic absorption

An automated method to determine both inorganic and organic forms of selenium in water is described. Organic selenium-containing compounds are first manually decomposed by hydrochloric acid-potasssium persulfate digestion. The selenium liberated, with inorganic selenium originally present, is reduced to selenite with stan-nous chloride and potassium iodide and then to hydrogen selenide with sodium borohydride. The hydrogen selenide is stripped from the solution with the aid of nitrogen and is then decomposed in a tube furnace heated to 800 degrees C. Selenium concentrations are determined by an atomic absorption spectrometer. Thirty samples per hour content of the selection of the select can be analyzed to levels of 1 microgram selenium per liter. W79-00261

LABORATORY STUDIES OF CAS TRACERS

FOR REAERATION, Geological Survey, Bay St. Louis, MS. Water Resources Div.

R. E. Rathbun, D. W. Stephens, D. J. Shultz, and

ASCE Proceedings, Journal of the Environmental Engineering Division, Vol. 104, No. EE2, Paper 13679, p 215-229, April 1978. 6 fig. 3 tab, 23 ref, 2

Descriptors: *Reaeration, *Tracers, *Gases, Laboratory tests, Least squares method, Ox-ygenation, Absorption, Evaluation, Hydrocarbon gases, Reaeration coefficient, Nonlinear least

Laboratory studies were conducted to determine the rates at which ethylene and propane desorbed from a water bath relative to the rate at which oxygen was absorbed by the same water. The ratios between the oxygen absorption coefficient and the hydrocarbondesorption coefficient were 1.15 and 1.29 for ethylene and propane, respectively. These ratios, which were independent of mixing conditions within the water and independent of water temperature over the range of 20 to 30 degrees C serve as the basis for a tracer technique for measuring reneration coefficients of streams. Nonlinear least squares procedures were used in the analysis of the concentration as a function of time data. Comparison of 2-parameter and 3-parameter procedures showed that the 3-parameter procedure was able to fit the data better in terms of a foot-mean-square error. However, estimats of of a foot-mean-square error also dissolved oxygen the saturation concentration for dissolved oxygen with the 3-parameter procedure were unreal Therefore, a 2-parameter procedure with the saturation concentration fixed at a literature value for the specific temperature and corrected for barometric pressure was used. The 2-parameter procedure was also used for the hydrocarbon data with the quilibrium concentration fixes at zero. W79-00270

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY, Geological Survey, Menlo Park, CA. Water Geological Su Resources Div. For primary bibliographic entry see Field 5B. W79-00271

CRITERIA DOCUMENT FOR DDT. CKITERIA DOCUMENT FOR DDT. Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-254 014, Price codes: A07 in paper copy, A01 in microfiche. Report EPA-440/9-76-010, 150 p. June 1976. 7 tab,

Descriptors: *DDT, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide kinetics, DDE, DDD, Chemical degradation, Animal pathology, Toxicity, Mortality, Pesticides, Organic compounds, Environmental effects, Path of pollutants, Chemical analysis, Chemical properties, Physicochemical properties, Water analysis, Water quality, Public health, Pesticide residues, Food chains, Aquatic life, *Bioaccumulation, *Tissue analysis, *Carcinogens.

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This document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of DDT, with emphasis on aquatic behavior. From these data criteria are developed for protection of aquatic organisms and for human exposure. (EIS-Deal) W79-00276

SAMPLING AND MODELING OF NON-POINT SOURCES AT A COAL-FIRED UTILITY, Research Corp. of New England, Wethersfield,

For primary bibliographic entry see Field 5B. W79-00279

Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 677, Price codes: A04 in paper copy, A01 in microfiche. Report EPA-440/9-76-014, June 1976. 63 p., 6 tab, 77 ref. CRITERIA DOCUMENT FOR TOXAPHENE.

Descriptors: *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide kinetics, Animal pathology, Environmental effects, Pesticides, Organic compounds, Path of pollutants, Chemical degradation, Toxicity, Mortality, Pesticides, Physiochemical properties, Chemical properties, Chemical analysis, Aquatic life, Water quality, Public health, Food chains, Pesticide residues, *Toxaphene, *Bioaccumulation, *Tissue analysis.

This document summarizes the physical/chemical properties, toxicological information and environmental fate and effects of Toxaphene, with emphasis on aquatic behavior. From these data a criterion for the protection of aquatic life and human health is developed. (EIS-Deal) W79-00281

DOCUMENTS FOR AL-DRIN/DIELDRIN.

Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 012,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5 Identification Of Pollutants-Group 5A

Price codes: A05 in paper copy, A01 in microfiche. Report EPAc440/9-76-008, 93 p, June 1976. 6 tab, 2 app., 94 ref.

Descriptors: *Aldrin, *Dieldrin, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, *Pesticide residues, *Pesticide residues, *Pesticide residues, *Physiochemical properties, Chemical properties, Chemical analysis, Water quality, Public health, Toxicity, Mortality, Path of pollucants, Environmental effects, Animal pathology, Fish physiology, Animal metabolism, Food chains, *Bioaccumulation, *Tissue analysis, *Carcinocens.

This document summarizes the physical/chemical properties, toxicological information and environ-mental fate and effects of Aldrin/Dieldrin, with mental face and effects of Alufin/Dietarin, win emphasis on aquatic behavior. From these data, criteria are developed for the protection of aquatic life and for human exposure. (EIS-Deal) W79-00282

PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS OPTICAL BRIGHTENERS, METHYL CHLOROFORM, TRI-CHLOROETHYLENE, TETRACHLOROETHYLENE AND ION EXCHANGE RESINS, Franklin Inst. Research Labs., Philadelphia, PA.

Science Information Services Dept.

F. D. Kover.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 910, Price codes: A13 in paper copy, A01 in microfiche.
U.S. Environmental Protection Agency, Office of Toxic Substances, Report EPA-560/2-75-002, 286 p, July 1975. 30 fig, 33 tab, 1 app, 155 ref.

Descriptors: "Resins, "Chemical analysis,
"Solvents, "Ion exchange resins, Organic compounds, Physiochemical properties, Chemical properties, Public health, Environmental effects,
Chemical wastes, Industrial wastes, Optical proporties, Animal physiology, Human pathology, Toxicity, Path of pollutants, *Optical brighteners, Bioaccumulation, Tissue analysis, *Carcinogens, *Mutagens, *Teratogens.

A comprehensive review of the literature published from 1953 through 1973 was conducted to prepare this preliminary investigation report on the physical and chemical properties of optical brighteners, methyl chloroform, trichloroethylene, tetrachloroethylene and ion exchange resins, on environmental exposure fac-tors related to their consumption and use, on the health and environmental effects resulting from exposure to these substances and on any applica-ble regulations and standards governing their use. (EIS-Deal)

A PERIPHYTIC MICROFLORA ANALYSIS OF THE COLORADO RIVER AND MAJOR TRIBUTARIES IN GRAND CANYON AND VICINITY, Northern Arizona Univ. Flagstaff. Dept. of Biological Science.

D. B. Czarnecki, D. W. Blinn, and T. Tompkins. Available from the National Technical Information Service, Springfield, VA 22161 as PB-267 761, Price codes: A06 in paper copy, A01 in microfiche. Grand Canyon National Park, Colorado River Research Program Report No. CRRP-06, 106 p. June 1976, 26 tab, 48 ref.

Descriptors: "Periphyton, "Oligotraphy, "Colorado River, Cyanophyta, Chlorophyta, Rhodophyta, Water quality, Ecosystems, Diatoms, Microorganisms, Aquatic algae, Trophic level, Colorado River basin, Bioinicators, Seasonal, Colorado, "Species diversity, Grand Canyon National Park."

A periphytic microflora analysis was conducted seasonally at selected sites on major tributaries

and at locations along the Colorado River in Grand Canyon National Park. A reltively high algal diversity was displayed yieling 345 taxa. The high diversity in combination with the overall scaricity of pollution tolerant species indicates a fairly young and possibly oligotrophic system. Major differences in taxe exist above and below Glen Canyon Dam. Based on ecological preferences of major taxa, the Colorado River can be considered to be a high alkalinity and conductivity system. (EIS-Deal) W79-00285

LABORATORY STUDY OF THE RELEASE OF PESTICIDE AND PCB MATERIALS TO THE WATE COLUMN DURING DREDGING AND DISPOSAL OPERATIONS,

DISPOSAL OPERATIONS, Envirex, Inc., Milwaukee, WI. R. Fulk, D. Gruber, and R. Wullschleger. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A026 685, Price codes: A06 in paper copy, A01 in microfiche. U.S. Army Engineer Waterways Ex-periment Station, Vicksburg, Mississippi, Report No. D-75-6, 112 p, December 1975: 10 fig, 43 tab, 4 app. 25 ref.

Descriptors: *Dredging, *Bottom sediments, *Pesticide residues, Chemical analysis, Water analysis, Pesticides, Polychlorinated biphenyls, Organic compounds, Dieldrin, DDT, Chlorinated hydrocarbon pesticides, Aldrin, Oil, Path of pollu-

Sediments, Water column water, and interfacial Sediments, Water column water, and interfacial water samples were obtained from dredged areas. Samples were analyzed for pesticide materials, PCB, oil and grease, total organic carbon, and silt and clay fraction. Measureable amounts of PCB were found in almost all samples. Of the pesticides, dieldrin and DDT compounds were the most common. Aldrin and 2,4-D esters were present in a few samples. No correlation was found between the amount of TOC, oil and grease, and silt and clay fraction, and the sediment PCB content or the interstitial water PCB content. (EIS-Deal) W79-00286 W79-00286

MANUAL OF ANALYTICAL QUALITY CON-TROL FOR PESTICIDES AND RELATED COM-POUNDS IN HUMAN AND ENVIRONMENTAL SAMPLES,

Lafayette Coll., Easton, PA. Dept. of Chemistry. I. Sherma

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-261 019, Price codes: A13 in paper copy, A01 in microfiche. U.S. Environmental Protection Agency, Health Effects Research Laboratory, Report EPA-600/1-76-017, February 1976. 290 p., 63 fig, 21 tab, 381

Descriptors: *Pesticide kinetics, *Chemical analysis, Gas chromatiography, Pesticides, Laboratory tests, Analytical techniques, Bioassay, Pesticide residues, Polychlorinated biphenyls, Chemical degradation, Chemical properties, Path of pollutants, Quality control, Testing procedures, Methodology, *Tissue analysis.

This manual primarily provides the pesticide chemist with a systematic protocol for the prevention and control of analytical procedures which arise in the analysis of human or environmental media. The sections dealing with inter- and intra-laboratory quality control, the evaluation and stan-dardization of materials used, and the operation of the gas chromatograph are intended to highlight and provide advice in dealing with many problems which constantly plague the pesticide analytical chemist. Techniques for confirming the presence or absence of pesticides in sample materials are treated, at some length. This highly important area provides validation of the data obtained by the more routine analytical procedures. Last, but by no means least in importance is a short dissertation

of the value and need for systematic training pro-grams for pesticide chemists. (EIS-Deal) W79-00287

MULTIMEDIA LEVELS-MERCURY, Battelle Columbus Lab., Columbus, OH. For primary bibliographic entry see Field 5B. W79-0029

TRACING SEWAGE EFFLUENT RECHARGE -TUCSON, ARIZONA, Arizona Univ., Tucson. Dept. of Hydrology and

Water Resources. T. R. Schultz, J. H. Randall, L. G. Wilson, and S.

N. Davis.

Paper presented at The Third National Ground Water quality Symposium, Las Vegas, Nevada, September 15-17, 1976. 8 p, 6 fig, 2 tab, 24 ref. OWRT A-063-ARIZ(2), 14-34-0001-7006.

Descriptors: *Sewage effluents, *Gas chromatog-raphy, Recharge, Water pollution sources, Pollu-tant identification, *Tracers, Ground-water con-

Dry washes or river beds are often used by southwestern communities to dispose of treated sewage effluent. Because many of these communities rely on ground water as a water supply, there. ties rely on ground water as a water supply, there is concern that this disposal practice may contaminate local aquifers. This has led to implementation of monitoring and tracing programs to quantify effluent and ground-water interactions and to development of efficient, easily used predictive models. The treated sewage effluent from the City of Tucson treatment plant has historically been used for irrigation and/or discharged to the normally dry. Sants Cur. River. Numerous amplingments of the program of the pr mally dry Santa Curz River. Numerous sampling programs have been undertaken to quantify the chemical quality, temperature, and microbiolog cal activity of the ground water in the area ner the Santa Cruz. Ground-water regions with hig Santa Cruz. Ground-water regions with high chloride and nitrate concentrations tend to be associated with areas irrigated with sewage effluent. Quality degradation due to channel recharge is not as evident because the effluent recharge is not restricted by fine materials plugging the channel deposits. Recharging water tends to mound near the contact between the Recent and Fort Lowell the contact between the Recent and Fort Lowes formations spreading laterally more rapidly than downward. A new tracer, trichlorofluoromethane (trade name Freon 11, Cl3CF) with applications similar to environmental tritium is being evaluated. Cl3CF enters the hydrologic cycle when it is partioned between the gas and liquid phases during raindrop formation. Cl3CF in water samples is separated and quantitatively measured by a gas chromatograph with pulsed electron-capture detector. W79-00299

PCB IN WATER, A BIBLIOGRAPHY, VOLUME

Office of Water Research and Technology,

Washington, DC.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-287 928,
Price codes: A09 in paper copy, A01 in microfiche.
Water Resources Scientific Information Center,
Report OWRT/WRSIC 78-203, July 1978. 73 p, 3

*Polychlorinated Descriptors: "Polychlorinated biphenylis, "Chlorinated hydrocarbon pesticides, DDT, Or-ganic compounds, "Bibliographies, Path of pollu-tants, Pesticide residues, "Pollutant identification, Toxicity, Water pollution effects.

This report, containing 206 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). Volume 1 and 2 (see W73-06501 and W72-04439) cover information announced in SWRA from October 1968 to October

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SOILS, A. Water

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ashington, Informa-B-254 014, nicrofiche. 976. 7 tab.

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Group 5A-Identification Of Pollutants

1975. Volume 3 covers the period from November 1975 to April 1978. Author and subject indexes are

OPTICAL CLASSIFICATION OF NATURAL CA. Visibility Lab.
For primary bibliographic entry see Field 2L.
W79-00318

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION, Norsk Inst. for Vannforskning, Blindern. R. F. Wright, and A. Henriksen.

Limnology and Oceanography, Vol. 23, No. 3, p 487-498, May 1978. 8 fig. 3 tab, 33 ref.

*Lakes, Descriptors: chemistry. *Surveys, *Acidic water, Chemical analysis, Ions. Hydrogen ion concentration, Chemicals, Geology Precipitation(Atmospheric), Surface waters, Weathering, Salts, Acids, Air pollution, Water pollution, Limnology, Acid precipitation.

The concentrations of major ions were determined in 155 representative, small, pristine lakes in southern Norway. The chemistry of these lakes appears to be governed by three factors: atmospheric inputs of seawater salts supply most of the Cl and Na; acid precipitation supplies most of the S94 and H(+); and terrestrial inputs of chemical weathering products account for most of the Ca, Mg, and HC03. The interaction of acid precipitation and geologic environment largely ex-plains pH levels in these lakes. Lakes in granitic terrains have low concentrations of major ions, low buffer capacities, and are often acidic (pH less than 5) when located in areas subject to acid precipitation. Sulfate is the major anion. Lakes in granitic terrains that do not receive highly acidic precipitation have pH levels greater than 5.5, and bicarbonate is the major anion. (Sima-ISWS)

HYDROGEOCHEMISTRY OF A CALCRETE-CONTAINING AQUIFER NEAR LAKE WAY, WESTERN AUSTRALIA,

Commonwealth Scientific and Industrial Research Organization, Wembly (Australia). Div. of

For primary bibliographic entry see Field 2F.

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS, Harbor Branch Foundation, Inc., Fort Pierce, FL.

C. F. Zimmermann, M. T. Price, and J. R.

Montgomery.
Estuarine and Coastal Marine Science, Vol. 7, No. 1, p 93-97, July 1978. 2 fig, 2 tab, 12 ref.

Descriptors: *Pore water, *Sampling, *Instrumentation, *Laboratory tests, Nutrients, Testing, Methodology, Estuaries, Sediments, Amonia, Phosphates, Nitrates, Nitrites, Silica, Porous ceramic samplers, Porous Teflon samplers.

A laboratory comparison study of porous Teflon and porous ceramic samplers which can be used to collect sediment pore water was performed for varying concentrations of NH4, PO4, NO3, NO2 and Si. Significant differences were evident between nutrient concentrations before and after being filtered through ceramic samplers. Mean per cent recoveries were 11% + or - 0.9 for NH4, 43% or -1.1 for PO4, 96% + or -0.1 for NO3, 85% + or -0.0 for NO2, and 111% + or -0.2 for Si (standard deviations for N = 5). Per cent recoveries using the Teflon sampler were from 98-106% for all nutrients tested. The Teflon samplers can be

placed in shallow estuarine sediments and samples collected over a 14-day without disturbing the sediment or clogging the sampler. With minor modifications, the sampler can be used to analyze salinity, chlorinity, and trace metals as well as nutrients in pore waters and would be especially valuable when frequent sampling at the same depth and location may be necessary over an extended period of time (i.e., diurnal or tidal studies). (Humphreys-ISWS) W79-00325

ISOTOPIC COMPOSITION OF SULFUR IN PRECIPITATION WITHIN THE GREAT LAKES BASIN,

Canada Centre for Inland Waters, Burlington

Contario).
J. O. Nriagu, and R. D. Coker.
Tellus, Vol. 30, No. 4, p 365-375, August 1978. 5
fig, 3 tab, 26 ref.

*Sulfur, *Sulfur,
*Precipitation(Atmospheric),
*Great Lakes
*Great Lakes region, Surveys, Sampling, Isotope
studies, Sulfur dioxide, Air pollution, Seasonal
Spatial distribution, Temporal distribution, Pollutants, Water pollution, Water pollution sources,
*Great Lakes Basin.

By monitoring both the isotope ratio variations and the concentrations of sulfur in bulk precipitation samples, the seasonal changes in the relative contributions of airborne sulfur from bacteriogenic and anthropogenic sources were assessed. Although the delta 34S values during the sessed. Although the delta 34S values during the winter months are generally higher than those of the summer months by about 4 parts per thousand, there is no corresponding seasonal variability in sulfur concentrations. In general, the average SO2 concentrations at urban stations are also higher during the winter months. Precipitation samples at urban sites usually have higher sulfur contents and are enriched in 34S compared to samples at rural and remote locations. On the basis of these observations, it was suggested that the bacteriogenic sulfur emissions within the basin may account for 10-30% of all the sulfur emitted in the basin. The data suggested that the biogenic release of sulfur from land areas may be smaller than the figures employed in many models of the global sulfur cycle. (Sims-ISWS) 79-00339

MODELING AND MONITORING OF TOXIC SPILLS AND TOXIC EFFLUENTS, Research Corp. of New England, Wethersfield,

For primary bibliographic entry see Field 5B. W79-00343

WASTEWATER ODOR PROBLEM SOLVING --PROCESS MODIFICATION VERSUS AIR TREATMENT.

Research Corp. of New England, Wethersfield,

For primary bibliographic entry see Field 5D. W79-00373

FACTORS INFLUENCING INDUCED AIR FLOTATION, Petrolite Corp., St. Louis, MO. For primary bibliographic entry see Field 5D. W79-00375

INFLUENCE OF METHODOLOGICAL FACTORS ON PLATE COUNTING OF AQUATIC BACTERIA: I. STATISTICAL ANALYSIS OF THE INCIDENCE OF TIME LASTING FROM SAMPLE COLLECTION UP TO COMMENCE-MENT OF COUNTING, (IN SPANISH), Instituto Nacional de Limnologia, Santo Tome (Argentina).
F. Emiliani.

F. Emiliani

Rev Latinoam Microbiol 18(4), p 201-208, 1976.

Descriptors: Reviews, Saprophytes, *Bacteria, *Statistical methods, Water sampling, *Pollutant identification, Analytical techniques.

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After reviewing previous papers published on this theme from 1894-1970 and explaining in detail statistical methods employed, the author demonstrates, through mathematical analysis, the importance of the time elapsed from water sampling up to commencement of work on plate counting of saprophytic bacteria and on the interpretation of results.—Copyright 1978, Biological Abstracts,

INVESTIGATION OF FACTORS AFFECTING BOD MEASUREMENT AND EXPERIENCE WITH THE 1-DAY BOD TEST, National Council of Paper Industry for Air and Stream Improvement, Inc., New York. W. L. Carpenter, and H. F. Berger. NCASI Stream Improvement Technical Bulletin, No. 305, 20 p, March, 1978. 2 fig, 20 ref, 7 tab.

Descriptors: *Pulp wastes, *Biochemical oxygen demand, *Testing procedures, Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Suspended solids, Analytical techniques, Testing, Refrigeration, Waste water(Pollution), Physical properties, Sampling, Pollutants, Pollutant identification, Waste storage properties, Sampling, Poidentification, Waste storage.

The required routine measurement of BOD and suspended solids concentration of final effluents is an integral part of almost every NPDES (National Pollutant Discharge Elimination System) permit but these measurements are time consuming. To but these measurements are time consuming. To reduce the time required for their conduct within the confines of approved methods, an investigation was conducted by the NCASI Southern Regional Center. It showed that external inoculum sources, such as domestic sewage, are not needed in the BOD measurement of biologically treated effluents (e.g., treated bleached kraft mill effluents). Biologically treated effluents were also demonstrated to serve as satisfactory sources of seed for primary effluents in the BOD test. demonstrated to serve as satisfactory sources of seed for primary effluents in the BOD test, although seeding was not required for most prima-ry effluents. Refrigerated storage (1-13 C) during composite effluent sampling biased the measured BOD upward; 18% and 6% of the refrigerated sam-ples showed an increase of 5 ppm or more and 9 ppm or more BOD, respectively. Although the im-pact of refrigerated storage was not uniform from pact of refrigerated storage was not uniform from mill to mill (nor occasionally among samples at a single mill), the frequent occurrence of measured elevated BOD values with refrigerated storage was elevated BOD values with refrigerated storage was evidlent. The initiation of refrigerated storage may, therefore, be significant in an individual mill's ability to meet a discharge permit condition. Favorable mill experiences with the 1-day BOD test in effluent quality management programs are described. (Swichtenberg-IPC) W79-00405

BIOASSAY RESULTS OF KRAFT MILL EF-FLUENT AT ARTIFICIALLY ELEVATED LEVELS OF BIOSOLIDS, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York. For primary bibliographic entry see Field 5C. W79-00406

FLAME-PHOTOMETRIC METHOD FOR THE DETERMINATION OF MAGNESIUM IN SPENT LIQUORS OF SULFITE PULP MILLS (PLAMENNOFOTOMETRICHESKII METHOD OPREDELENIYA MAGNIYA V SHCHELOKAKH SUL'FITNO-TSELLYULOZ-NOGO PROIZVODSTVA), V. A. Smirnova, S. Kh. Kitaeva, and L. A.

Mazitov. Sbornik Trudov, Tsentralnyi Nauchno-Iss-ledovatel'skii Institut Bumagi, No. 10, p 213-216, 1975. 1 fig, 5 ref, 1 tab.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

Descriptors: *Sulfite liquors, *Pollutant identifica-tion, *Magnesium, *Flame photometry, Wastes, Industrial wastes, Pulp wastes, Pulp and paper in-dustry, Water pollution sources, Effluents, Ion exchanges, Cation exchange, Waste identification, Chemical analysis, Analytical techniques, Spent sulfite liquor.

The method described for determining the magnesium in magnesium-base spent sulfite liquors consists in separating the organic and mineral components on an ion-exchange column filled with a cation-exchange resin, eluting magnesium with HCI solution, and determining it in the eluate by flame photometry. The procedure was applied to spent liquors from laboratory sulfite cooks, and the results were compared with those obtained by the trilonometric method. The results from the two methods differed by not more than 4%. The sensitivity of the flame-photometric determination is 10 micrograms/ml. The method, which is less time-consuming than the presently used method and is more accurate, can be recommended for use in research and mill laboratories. (Stapinski-IPC) W79-00415

ELECTRIC RESISTANCE OF THE CATIONSELECTIVE MK-40 MEMBRANE DURING
ELECTRODIALYSIS OF SPEND SULFITE
LIQUOR (ELEKTROSOPROTIVLENIE KATIONOSELEKTIVNOY MEMBRANY MK-40
PRI ELEKTRODIALZE OTRABOTANNOGO
SUL-FITNOGO SHCHELOKA),
V. A. Kirsanov, and L. A. Mazitov.
Sbornik Trudov, Tsentralnyi Nauchno-Issledovatel'skii Institut Bumagi, No. 10, p 220-223,
1975. 2 fig. 2 ref. 1 tab.

1975. 2 fig, 2 ref, 1 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Electrodialysis, *Membranes, Energy, Electrical resistance, Water pollution sources, Wastes, Industrial wastes, Pulp and paper industry, Temperature, Water pollution treatment, Waste treatment, Membrane processes, Dialysis, Separation techniques, Spent sulfite liquor.

The electric resistance of the cation-selective Mk-40 membrane was studied under conditions cor-responding to the dialysis process described previously for magnesium-base spent sulfite pulping liquor. It is shown that the resistance of the membrane is determined to a large extent by the degree of base recovery and the temperature of the system, and to a lesser degree by the concentration of the spent liquor. At 22-58C and a liquor concentration range of 77-355 g/liter, the reduction of the membrane resistance is 8-10, 4, and less than 2 ohm-em/degree centigrade for degrees of recovery of zero, 41, and 69%, respectively. (Stapinski-IPC) W79-00417

CHARACTERIZATION OF BLEACHING LIQUORS. PART 1. ULTRAFIL-TRATION OF EFFLUENTS FROM CONVEN-TIONAL AND OXYGEN BLEACHING SEQUENCES, Helsinki Univ. of Technology, Otaniemi (Finland). Lab of Wood Chamistre.

Lab. of Wood Chemistry.
For primary bibliographic entry see Field 5D.
W79-00419

THE PHOSPHAGENS OF SOME PROTOZOA THE PHOSPHAGENS OF SUME PROTOCOMA AS ECOLOGICAL INDICATORS (IN FRENCH), Cagliari Univ. (Italy). Faculty of Medicine. U. Laudani, A. Di Jeso, and F. Di Jeso. CR Seances Soc Biol Fil 171(3), p 530-534, 1977.

*Phosphagens, *Protozoa. Bioindicators, Aqutic environments, *Protozoa, *Bioindicators, Aqutic environments, *Phosopho-arginine, Aspidisca-Lynceus, Colpoda-steini, Col-podium-colpoda, Italy, Paramecium-caudatum, *Sardinia, Urocentrum-turbo.

Five species of non-parasitic ciliate protozoa be-longing to 3 orders and used as biological indica-tors of aquatic environments were collected on the highlands in Sardinia and the nature of their phosphagens studied (Colpodium colpoda Ehrenberg, Paramecium caudatum Ehrenberg, Urocentrum turbo Muler, Colpoda steini Maupas, Aspidisca lynecus Ehrenberg). Phospho-arginine is present in all 5 spp.--Copyright 1978, Biological Abstracts, Inc. W79-00423

HYDROCHEMICAL INFLUENCES ON THE FISHERY WITHIN THE PHOSPHATE MINING AREA OF EASTERN IDAHO, Intermountain Forest and Range Experiment Sta-tion, Ogden, UT. For primary bibliographic entry see Field 5C. W79-00427

ANALYSES OF PAPER MACHINE WATERS WITH ION SPECIFIC ELECTRODES, PART IV. SULFATE DETERMINATION USING PB(2+) ION SPECIFIC ELECTRODE AND VARIOUS MEASUREMENT METHODS, Valmet Oy, Jyvaskyla (Finland). J. Korhonen, and P. O. Lumme. Paperi ja Puu, Vol. 60, No. 2, p 81-82, 84-86, February, 1978. 2 fig, 13 ref, 6 tab.

Descriptors: "Water analysis, "Sulfates, "Pulp wastes, Electrodes, Lead, Ions, Analytical techniques, Wastes, Industrial wastes, Water pol-lution sources, Pulp and paper industry, Storage, Waste storage, Bacteria, Hydrogen sulfide, Volu-metric analysis, White water(Paper machine), Waste water(Pollution).

The Pb(II)-specific electrode was applied to the The Pb(II)-specific electrode was applied to the determination of sulfate ion concentration in paper machine white waters, using direct titration or Gran's method; in the latter, the end-point was established with the help of Gran's plot paper. Samples were collected from two paper machines, one of which contained hydrogen sulfide-forming bacteria in its water circuit. Some samples were bacteria in its water circuit. Some samples were analyzed immediately, others were stored in bottles and tested at weekly intervals to examine the effect of anaerobic hydrogen sulfide formation on the analytical data. Direct-titration values were a few percent below the gravimetric data. Gran's technique produced somewhat greater negative errors. Although the concentrations obtained from samples subject to hydrogen sulfide formation showed some variations, the measurements from the other samples had good reproducibility. (See also W74-11094 and W74-11093) (Brown-IPC) W79-00429

EVALUATION OF DONNAN DIALYSIS FOR THE ENRICHMENT OF CATIONS, Southern Illinois University, Carbondale, Department of Chemistry and Biochemistry.

J. E. DiNunzio.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 182, Price codes: A08 in paper copy, A01 in microfiche. Ph.D Dissertation, September 1977. 137 p, 24 fig, 19 tab, 107 ref. OWRT A-087-ILL(2).

Descriptors: *Chemical reactions, *Dialysis, *Cations, *Ion exchange, *Heavy metals, Electrodialysis, Electrolytes, Chemical analysis, Absorption, Spectroscopy, Ion transport, Membranes, Transfer, Toxicity, Ions, Copper and mercury enrichment, Atomic absorption spectrometry, Ion selective membranes, Cation enrichment, Donnan Dialysis.

The rate of enrichment of cations by Donnan dial-ysis depends upon the identity of the ion exchange membrane counterion, the ionic strength of the receiver electrolyte, the stirring efficiency and the temperature. With counterions selected from Periodic Groups IA-IIIA, the rate increased with

group number and with smaller atomic number within a group; hence Al(III) was the ideal receiver electrolyte cation. Enrichment factors of 10 were accomplished in 30 minutes when Cu(II) was the test species. The method compares favorably, in terms of precision and sensitivity, to solvent extraction as an enrichment method to use in conjunction with atomic absorption spectrometry; however, it is applicable to a wider range of cations. The method was applied to the enrichment of Hg(II) from natural samples. Acidification was necessary to break up the neutral hydroxy complex.

INVESTIGATION OF RAINWATER FOR THE PRESENCE OF ASBESTOS,
Illinois Univ. at the Medical Center, Chicago.

Illinois Univ. at the Medical Center, Chicago. C. S. Hesse. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 084, Price codes: A04 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 47 p, 4 fig. 5 tab, 62 ref. OWRT A-071-ILL(4).

Descriptors: "Rain water, "Asbestos, Sampling, Data collections, Filtration, Illinois, Water pollu-tion sources, Pollution identification, "Chrysotile, Chicago.

A feasibility study was undertaken in order to determine if chrysotile asbestos is present in rainwater. Rainwater samples were collected at one Chicago and two suburban Chicago locations. The Chicago location was near a busy intersection and building construction. The two suburban stations building construction. The two suburban stations were located in residential areas. None of the suburban rainwater sampls contained levels of chrysotile which were significantly above laboratory contamination levels (alpha = .05). All the Chicago rainwater samples contained significant levels of chrysotile. This finding suggests a mechanism by which asbestos may be transferred from air to surface water.

W79-00437

MUSCULIUM TRANSVERSUM IN THE IL-LINOIS RIVER AND AN ACUTE POTASSIUM BIOASSAY METHOD FOR THE SPECIES, Western Illinois Univ., Macomb. For primary bibliographic entry see Field 5C. W79-00443

RECOVERY OF SANITARY-INDICATOR BAC-TERIA FROM STREAMS CONTAINING ACID MINE WATER,
West Virginia Univ., Morgantown.
M. L. Double.
Available from the National Technical Informa-

Avanable from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 156, Price codes: A07 in paper copy, A01 in microfiche. M S Thesis, 1977. 117 p, 2 fig, 25 tab, 109 ref, ap-pend. OWRT A-033-WVA(1).

Descriptors: *Acid mine water, *Coliforms, *Enteric bacteria, *Sewage bacteria, *Streptococcus, Bacteria, Bioindicators, Domestic wastes, E. Coli, Filters, Membranes, Meus-membrane filters, Microorganisms, Mine water, Separation techniques, Sewage effluents, Water pollution, Water quality, Enriched culture media, Bacterial-recovery methods.

Improved membrane-filtration methods for better recovery of sanitary-indicator organisms from aquatic environments containing acid mine water were evaluated. Adjustment of sample pH, use of various membrane-filter brands, and incorporation of an enrichment step were examined for samples from various aquatic environments. Comparison of the recovery efficiency of various methods used to enumerate coliform bacteria from water indicated that generally, multiple-tube fermentation techniques size recovery superior to permentation techniques size recovery superior to permentation. tion techniques give recovery superior to mem-brane-filtration procedures, but use of resuscita-

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Nauchno-Iss-10, p 213-216,

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Group 5A-Identification Of Pollutants

tion broth as an enrichment medium greatly improved the recovery efficiency of the membrane-filtration technique. In some instances, recovery densities of the enriched membrane-filtration procedures, but use of resuscitation broth as an enrichment medium greatly improved the recovery efficiency of the membrane-filtration technique. In some instances, recovery densities of the enriched membrane-filtration method were greater than the Most-Probable-Number technique. Comparison of three brands of membrane filters revealed that Gelman GN-6 yielded the highest coliform recovery and Nuclepore the least. Other methods used to improve the membrane-filtration efficiency proved ineffective. Qualitative studies of the Hartman Run drainage area showed that acid mine water may produce a differential inhibitory effect to members of the Enterobacteriaceae. The use of a two-step enrichment procedure improved the recovery of certain genera, Klebsiella. That enrichment techniques be adopted to aid in assessing the sanitary quality of water is recommended.

A COMPARATIVE IN VITRO STUDY OF THE EFFECTS OF VARIOUS BALANCED SALINE SOLUTIONS ON RESPIRATION RATES OF LIVER TISSUES OF THREE FISH SPECIES, Tennessee Technological Univ., Cookeville. For primary bibliographic entry see Field 5C. W79-00454

CHLOROFLUOROCARBONS AS HYDROLOGIC TRACERS A NEW TECHNOLOGY, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

J. H. Randall, and T. R. Schultz.

Hydrology and Water Resources in Arizona and the Southwest, Vol. 6, p 189-195, 1976. OWRT A-063-ARIZ(3), 14-34-0001-7006.

Descriptors: *Gas chromatography, *Tracers, Air pollution, Atmosphere, Pollutant identification, *Chlorofluorocarbon, Dating water.

The nationwide research undertaken to study environmentally dispersed chlorofluorocarbons in troduced into the atmosphere from aerosol cans and refrigeration systems has indicated that these compounds are potentially ideal hydrologic tracers, especially Freon-11 (Cl3CF). The major advantages of Cl3CF as a tracer are its non-polluting conservative nature, extremely low toxicity and sorptivity on clays, quantifiable build-up in the atmosphere, and a detection limit of about 10-14 grams. Quick and inexpnsive detection of Cl3CF can be done using a field-operable gas chromatograph with a pulsed electron-capture detector system. The presence of Cl3CF in ground water, indicating an age of less than 30 years, will permit delineation of recent recharge areas. The absolute age of the recharging water is proportional to the atmospheric concentration of Cl3CF at the time of recharge. The simple quantifiable increase of Cl3CF in the atmosphere should therefore yield more accurate ages than those determined by tritium analysis.

5B. Sources Of Pollution

NUTRIENT LOADING/LAKE TROPHIC CON-DITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSH-ING RATE, Maine Univ. at Orono. For primary bibliographic entry see Field 5C. W79-00001

THE SOURCE OF AMERICAN FALLS RESER-VOIR POLLUTANTS, Idaho State Univ., Pocatello. D. W. Johnson, and J. C. Kent. Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 628, Price codes: A02 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, June 1978. 19 p, 1 fig. 1 tab, 35 ref. OWRT A-056-IDA(1). 14-34-0001-7028.

Descriptors: *Idaho, *Upper Snake River Basin(Ida), *Water pollution sources, Sewage effluents, Municipal wastes, Industrial wastes, Chlorinated hydrocarbon pesticides, Pesticide residues, *Non-point pollution sources, Pollutants, *Cadmium, *Mercury, Portneuf River(Ida), Snake River(Ida), *America Falls Reservoir(Ida).

The Upper Snake River Basin contained elevated amounts of cadmium and mercury. Three sources are possible: sewage effluents from large towns in the area, run-off from irrigated lands (both cadmium and mercury are found in phosphate fertilizers), or drift from air currents carrying emissions from phosphate and cement plants. Industrial and municipal facilities located adjacent to the lower Portneuf River near Pocatello appear to be contributing cadmium and mercury to the aquatic environment. Chlorinated hydrocarbons detected in dangerous levels in reservoir fishes are usually associated with agricultural pesticides that have entered the water; however, low solubility in water results in undetectable levels in both the Portneuf and Snake Rivers.

CHARACTERIZATION AND TREATMENT OF STORMWATER RUNOFF.

STORMWATER RUNOFF, Colorado Univ., Boulder. Dept. of Civil Environmental and Architectural Engineering.

F. W. Pontius.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 576, Price codes: A16 in paper copy, A01 in microfiche.

M.S. Thesis, 1977. 325 p. 82 fig, 84 tab, 70 ref, append. OWRT A-028-COLO-(3). 14-34-0001-8006.

Descriptors: "Urban runoff, "Stormwater, Runoff, Water quality, "Urban drainage, Water pollution treatment, Water pollution sources, "Waste water treatment, Cities, Water treatment, Chemical precipitation, Ferric chloride, Lime, Filtration, Sedimentation.

A 125 acre urban area and a 15 acre agricultural area were selected for study. The urban area was serviced by separate storm and sanitary sewer systems and had an average population density of 12 persons per acre. The agricultural area was cultivated in alfalfa and had an average slope of 2.5 feet per 100 feet. Concentrations of pollutants in the urban stormwater runoff were found to vary widely. Solids, COD, chlorides, and bacterial densities were found at significant levels. Nutrient levels remained low throughout the study period. Pollutant contributions due to stormwater runoff from the urban area were significantly lower than those reported in previous studies. This was attributed to the differences in land use between the areas investigated. The significance of snowmelt runoff from the urban area appeared to be minor when compared to the estimated pollutants con-tributed by treated sewage from a similar size area. Processes evaluated for the treatment of urban stormwater runoff were plain sedimentation, chemical clarification using alum, ferric chloride, and lime, and filtration. Clarification with ferric chloride was the most effective process, yielding an average pollutant removal efficiency of 89 percent. Filtration and clarification with alum were also effective, resulting in average pollutant removals of 87 and 84 percent, respectively. The effectiveness of plain sedimentation was found to depend on the nature of the individual stormwater samples. A detention time of four hrs. resulted in an overall removal efficiency of only 42%.

FACTORS CONTROLLING VARIATIONS IN RIVER WATER QUALITY IN KANSAS, Kansas Water Resources Research Inst., Manhat-

D O Whittemore

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 578, Price codes: A04 in paper copy, A01 in microfiche. Contribution No 197, August 1978. 46 p, 14 fig, 8 tab, 12 ref. OWRT A-080-KAN(1). 14-34-0001-8018.

Descriptors: *Rivers, Water quality, Kansas River basin, *Arkansas River basin, Runoff, Watershed management, Chemical precipitation, Watershed studies, *Water quality control, *Quickflow, *Baseflow.

The most important factor controlling the quality of river waters in Kansas is the variation in the amounts and chemistry of quickflow (reflecting dissolution of constituents from soils and near surface alluvium) versus baseflow (mainly groundwater inflow). Given similar bedrock, the higher the average eanual precipitation and the lower the average eapporation rate, the lower the total dissolved solids (TDS) of both quickflows and baseflows. Quickflows have lower TDS and Na/(Na + Ca) than baseflows. Primary sources of high TDS in baseflows are saline formation waters and dissolution of halite and gypsum; in western and central Kansas evaporative concentration also contributes to high TDS and can increase Na/(Na + Ca) slightly by calcite crystallization. Two types of cyclic relationships occur in chemical hydrographs of precipitation or snowmelt events: a quickflow flushing-dilution cycle follows a counterclockwise loop and a quickflow dilution-saline groundwater discharge cycle a clockwise loop when discharge is plotted versus specific conductance, TDS, or Na/(Na + Ca). A procedure is proposed for controlling the quality of river waters receiving saline groundwaters: a system of small flood retarding and recharge structures with baseflow release drains should be built far enough upstream of saline inflow areas, that groundwater recharge increases good quality baseflow and decreases mineralized discharges.

IS CHRYSOTILE ASBESTOS RELEASED FROM ASBESTOS-CEMENT PIPE INTO DRINKING WATER., Illinois Univ. at the Medical Center, Chicago.

Illinois Univ. at the Medical Center, Chicago. For primary bibliographic entry see Field 5A. W79-00013

DETERMINATION OF CHRYSOTILE ASBESTOS IN RAINWATER, Illinois Univ. at the Medical Center, Chicago. For primary bibliographic entry see Field 5A. W79-00014

UPTAKE AND FATE OF DI-2-ETHYLHEXYL PHTHALATE IN AQUATIC ORGANISMS AND IN A MODEL ECOSYSTEM,

Illinois Univ. at Urbana-Champaign Dept. of Zoology and Entomology.
R. L. Metcalf, G. M. Booth, C. K. Schuth, D. J. Hansen, and P. Y. Lu.

Environmental Health Perspectives, Experimental Issue, No. 4, p 27-34, 1973. 5 fig, 3 tab, 11 ref.

Descriptors: *Plastics, *Absorption, *Biodegradation, Organic compounds, Path of pollutants, Animal metabolism, Daphnia, Mosquitos, Clams, Food chains, Food webs, Chemical properties, Industrial wastes, Chemical wastes, *Phthalates, *Teratogens, *Biomagnification, *Tissue analysis, Dizoethylhexyl phthalate.

The experiments demonstrated that DEHP is a microchemical environmental pollutant which is rapidly biomagnified by a variety of plants and IONS IN

Informa B-287 578, icrofiche , 14 fig, 8 4-34-0001-

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DEHP is a ant which is animals in an aquatic system. DEHP is biodegraded very slowly in algae, Daphnia, mosquito larvae, snails, and clams and more rapidly in fish. However, DEHP closely resembles rapidly in fish. However, DEHP closely resembles DDT in rate of uptake and storage, and it obviously partitions strongly in the lipids of plants and animals and is concentrated through food chains. The biomagnification of DEHP together with its programmy rate of production and ubiquitous use indicate the need for much further study of its environmental distribution and fate. Present data suggest the need for restrictions on the use and waste disposal of DEHP. (EIS-Deal)

STUDIES ON THE PATHWAYS AND EFFECTS OF CADMIUM IN CONTROLLED ECOSYSTEM ENCLOSURES, kiel Univ. (West Germany). Inst. fuer Meerekunde.

K. Kremling, J. Piuze, K. von Brockel, and C. S.

Wong. Marine Biology, Vol. 48, p 1-10, 1978. 11 fig, 3 tab, 26 ref

Descriptors: *Cadmium, *Phytoplankton, *Biological communities, Ecosystems, Heavy metals, Water pollution effects, Membrane processes, Biological membranes, Toxicity, Onsite data collections, Comparative productivity, Productivity, Biomass.

Two experiments were performed during 1975 and 1976, in which cadmium was added to seawater and its plankton enclosed in plastic containers moored in Saanich Inlet (Vancouver Island, Canada), as part of the CEPEX project. In both experiments, two enclosures were used; one was spiked with about 1.3 microg 1-1 cadmium, while the other served as a control, to assess the fate of the added metal and its effect on marine phytoplankton. In both experiments, the pattern of biological events was found to be very similar for the cadmium-treated bag and for the control. Furthermore, there was no marked differences in the phytoplankton species composition, thus indicating that at this concentration level cadmium did not affect the ecosystem. The rate of removal of cadmium by biological processes was relatively slow. Experiments on the mechanism of cadmium binding indicated that the major part of the par-ticulate metal is loosely bound to the outer cell membranes. (EIS-De.d)

UPTAKE OF AMERICUM-241 BY ALGAE AND BACTERIA, Savannah River Ecology Lab., Aiken, SC. J. P. Giesy, Jr., and D. Paine. Progress in Water Technology, Vol. 9, p 845-857, 1977. 4 fig, 3 tab, 27 ref.

Descriptors: *Radioisotopes, *Absorption, *Membrane processes, Cytological studies, Biological membranes, Bacteria, Path of pollutants, Chlorophyta, Chemical analysis, Chemical properties, Metabolism, Hazards, Radioactive wastes, *Americum, Biomagnification.

Algae and bacteria concentrate 241Am to a high degree, which makes them important links in the biomagnification phenomenon which may ulti-mately lead to a human hazard. The ability of algae and bacteria to highly concentrate 241Am makes them potentially important in cycling 241 Am in the water column and mobilization from the sediments. (EIS-Deal) W79-00067

TRANSURANIC NUCLIDES IN PLAICE (PLEURONECTES PLATESSA) FROM THE NORTH-EASTERN IRISH SEA, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

R. J. Pentreath, and M. B. Lovett. Marine Biology, Vol. 48, p 19-26, 1978. 2 fig, 8 tab,

Descriptors: *Radioisotopes, *Nuclear wastes, Animal metabolism, Path of pollutants, Nuclear energy, Radioactive wastes, Fish physiology, Public health, Radioactive waste disposal, Water pollution sources, Hazards, Marine fish, *Plaice, Pleuronectes, *Tissue analysis, *Americium, *Plutonium, Curium, Flounders, Irish Sea.

The concentrations of a number of alpha-emitting nuclides, 238Pu, 239/240Pu, 241Am, 242Cm and 243/244Cm have been determined in the organs of plaice caught in the vicinity of a nuclear fuel reprocessing plant. Fish were taken for analysis every 3 months for a period of 2 years. During this period, the highest concentrations of plutonium and mericium nuclides were found in the kidney and the lowest in muscle. In all of the organs analysed, the concentrations of americium were greater than those of plutonium: they were also orgenter than plutonium when related to the rates of greater than plutonium when related to the rates of discharge of these two elements and gave higher concentration factors over samples of filtered shore-line sea water taken from the area. (EIS-W79-00077

FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II, American Museum of Natural History, Placid, FL. Archbold Biological Station. For primary bibliographic entry see Field 5C. W79-00100

POLLUTION OF GROUNDWATER THROUGH

POLLUTION OF GROUNDWATER THROUGH NONLINEAR DIFFUSION, Punjab Agricultural Univ., Ludhiana (India). Dept. of Civil Engineering. P. Basak, and V. V. N. Murty. Journal of Hydrology, Vol. 38, No. 3/4, p 243-247, August 1978. 3 fig, 10 ref.

Descriptors: *Groundwater, *Water pollution, *Diffusion, Aquifers, Water pollution sources, Pollutants, Path of pollutants, Model studies, Mathematical models, Equations, Nonlinear diffu-

An analytical solution for the prediction of the spread of contaminant caused by nonlinear diffusion in an aquifer adjoining a polluted source was presented. The solution was based on the assumption of the existence of a sharp diffusion front and was similar to the solution of a two-dimensional was similar to the solution of a two-dimensional unsaturated flow problem. The effect of concen-tration dependency of the diffusion coefficient on the contamination spread was discussed. (Sims-ISWS) W79-00110

TEMPERATURE ESTIMATION

USING KALMAN FILTER,
Pittsburgh Univ., PA. Dept. of Civil Engineering.
C. L. Chiu, and E. O. Isu.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 13991, p 1257-1268, September 1978, 4 fig. 16 ref, 2 append.

Descriptors: "Water temperature, "Streams, "Model studies, "Statistical methods, Mathematics, Equations, Stochastic processes, Systems analysis, Theoretical analysis, Mathematical models, Analytical techniques, Surface waters, Rivers, Regression analysis, Streamflow, Forecasting, Time series analysis, "Kalman filter.

The system model used combines the deterministic sinusoidal model with a simple stochastic

(first-order autoregressive) model of the residuals from the actual temperature of the temperature estimation given by the sinusoidal model. The estimation and forecasting technique was tested for its capability to generate daily streamflow temperature between several different measurement internals. Benefit with these filters. vals. Results with Kalman filter were compared with those obtained in the 4 parallel models (the with those obtained in the 4 parallel models (the sinusoidal, the sinusoidal coupled with either the first-order or second-order autoregressive modeling of the random deviations, and the sinusoidal coupled with first-order autoregressive-moving average modeling of the random deviations). The mean-square deviation of estimated or predicted temperatures from the actually observed was used to measure the relative accuracy of the estimations. to measure the relative accuacy of the estimations by the 5 different techniques. The results showed a definite advantage of using Kalman filter. (Humphreys-ISWS) W79-00121

ACID PRECIPITATION IN THE NETHER-

Department of Environmenta Control. Haarlem (Netherlands).
For primary bibliographic entry see Field 5A. W79-00138

MEMBRANE CONCENTRATION OF INFEC-TIOUS BOVINE RHINOTRACHEITIS VIRUS FROM WATER, North Dakota State Univ., Fargo.

For primary bibliographic entry see Field 5C. W79-00148

B. R. /HANSON ; I. A. /SCHIPPER North Dakota State Univ., Fargo. Dept. of Veterinary Science. For primary bibliographic entry see Field 5C. W79-00150

SEA-WATER NEUTRALIZATION OF EF-FLUENTS FROM THE INDUSTRIAL PROCESSING OF PHOSPHORITE. A CASE STUDY IN THE PRACTICAL USE OF BASIC KNOWLEDGE IN ANALYTICAL AND MARINE

CHEMISTRY, Chalmers Univ. of Technology, Gotborg (Sweden); and Goteborg Univ. (Sweden). Institutionen for Analytisk Kemi. For primary bibliographic entry see Field 5G. W79-00151

ADSORPTION OF SOME TOXIC SUBSTANCES BY WASTE COMPONENTS, Waste Research Unit, Oxon (England). Harwell

C. J. Jones, P. J. McGugan, A. J. Smith, and S. J.

Wright. Journal of Hazardous Materials, Vol. 2, No. 3, p 219-225, 1977/1978. 3 tab. 7 ref.

Descriptors: *Adsorption, *Cadmium, *Toxins, *Solid wastes, *Leachate, Isotherms, Textiles, Anions, Cations, Solvents, Plastics, Sands, Aqueous solutions, Leaching, Arsenic compounds, Waste water treatment, Metals, Chemical wastes, Chemical industry, Industrial wastes.

Refuse components were capable of adsorbing sig-Refuse components were capable of adsorbing sig-nificant quantities of inorganic cationic cadmium, inorganic anionic arsenate, and the halogenated solvent, trichloroethylene, when contacted for a sufficient period of time. A 1000 mg/liter sample of each toxic substance was mixed with an aqueous solution bearing 5000 vpm of acetic acid to represent leachate from a landfill or waste deposi-tory, acidium budravide was used to very the all represent teachate from a landth or waste deposi-tory; sodium hydroxide was used to vary the pH over 3, 7, and 9. A 200 ml aliquot of the solution was contacted for 24 hrs at 30C with 10 g of un-printed newspaper, dacron/cotton material, polyethylene, and lower greensand, representing refuse components. The adsorption of arsenate

Group 5B-Sources Of Pollution

and cadmium by the refuse components generally conformed to a Langmuir isotherm with only several instances of observed reversible adsorption. The saturation concentrations in the absorbents ranged about 6,500-15,000 ppm cadmium and about 25-500 ppm arsenate; for both toxins, paper was the most efficient adsorbent, although some reversibility was observed. A Freundlich isotherm depicted the linear adsorption of trichloroethylene from solution onto the refuse components; the saturation concentration of the toxin ranged over 8,000-10,000 ppm (volume/wt) in polyethylene and textile. Saturation levels were lower with paper and with decreasing pH. The solution pH had a significant effect on the adsorption of arsenate and to a lesser extent on cadmium tion of arsenate and to a lesser extent on cadmium and trichloroethylene. (Lisk-FIRL) W79-00152

DEGRADATION OF AQUEOUS PHENOL SOLUTION BY GAMMA IRRADIATION, Hiroshima Univ., (Japan). Inst. of Environmental Chemistry.
For primary bibliographic entry see Field 5D.

W79-00153

OIL-TROUBLED WATER. American Ground buquerque, NM. Water Consultants, Al-W. M. Turner. Geotimes, Vol. 23, No. 9, p 21-22, September,

Descriptors: *Pollution abatement, *Groundwater movement, *Groundwater contamination, *Oil spills, Reclamation, Remote sensing, Organic

The International Association of Hydrogeologists held a symposium in Prague on June 4-6 which dealt with problems of ground-water contamination by oil spill in highly industrialized areas. The main themes of the symposium were: (1) methods of hydrogeologic exploration and decontamination of rock and ground water contaminated by oil; (2) movement of oil in ground water and rocks; (3) chemical relations in the rock-ground water-oil system; and (4) location and delimitation of contaminated rock and ground water by surface methods. Remote sensing methods to delineate areas contaminated by oil spills, and physical and biological methods of reclamation were among the 34 technical papers presented. Following the technical sessions, there were two field trips to spill sites where physical reclamation methods were being employed. At one site, large diameter wells were used to remove the hydrocarbon, while at the other site, deep trenches were used. (Purdin-NWWA) W79-00169

NO WATER-SOURCE DAMAGE FOUND IN OIL

For primary bibliographic entry see Field 5G. W79-00172

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. AP-

PENDIX A, Battelle Pacific Northwest Labs., Richland, WA. A. Brandstetter, D. B. Cearlock, R. G. Baca, W. Waddel, and C. R. Cole.

w. waddet, and C. R. Cole. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-256 933, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, DC, August 1973. 87 p. 8 fig. 2 tab,

Descriptors: "River basin development, "Project planning, "Water pollution, "Computer models, "Simulation analysis, "Water quality control, Biochemical oxygen demand, Hydrodynamics, Stratification, Hydraulic models, Reviews, Mathe-

matical models, Benthos, Dissolved gases, Algae, Carbon, Oxygen, Toxicity, Equations, Systems analysis, Bibliographies.

Battelle-Northwest has developed a generalized, comprehensive mathematical water quality model, EXPLORE-I, for use in river basin plans vater resource studies. The model can predict the water resource studies. The model can predict the hydrodynamics and water quality dynamics for rivers, well-mixed estuaries, and thermally-stratified reservoirs. This computer model is an extended and modified version of the Storm Water Management Model (receiving-water component) which was developed for studies of DO/BOD dynamics. This appendix 'A' to the main report entitled, 'EXPLORED-I: A River Basin Water Ouality Model'. contains a comprehensive review Quality Model', contains a comprehensive review of various water quality submodels, river and estuary hydrodynamic models, and deep reservoir hydrothermal models. The water quality subodels identified herein are the result of an extensive literature survey of over three-hundred seven-ty published articles and books. (See also W79-00187) (Bell-Cornell)

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX

Battelle Pacific Northwest Labs. Richland, WA. R. G. Baca, W. W. Waddel, C. R. Cole, A. Brandstetter, and D. B. Cearlock. Available from the National Technical Informa

tion Service, Springfield, VA 22161 as PB-236 934, Price codes: A06 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., August 1973. 97 p, 16 fig, 15 tab. 6 ref.

Descriptors: *River basin development, *Water pollution, *Computer models, *Water quality control, *Simulation analysis, Computer programs, Streamflow, Waste disposal, Sewage treatment, Mathematical models, Hydraulics, Systems analy-

Battelle-Northwest has developed a generalized, comprehensive mathematical water quality model, EXPLORE-I, for use in river basin planning an water resource studies. This computer model stimulates the dynamic hydraulic and water quality characteristics of a river basin to study the effects of various flow conditions, waste discharge, and treatment schemes on water quality levels; it can also be used to study lakes, reservoirs (thermally-stratified), and well-mixed estuaries. It is an extended and modified version of the Storm Water Management Model (receiving-water com ponent) which was developed for studies of DO/BOD dynamics. This User's Manual, Appendix B provides the information needed for se up and analyzing a river basin. Descriptions of the models and their use are also provided. (See also W79-00187) (Bell-Cornell)

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY, APPENDIX

Battelle Pacific Northwest Lab., Richland, WA. R. G. Baca, W. W. Waddel, C. R. Cole, A. Brandstetter, and D. B. Cearlock.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 935, Price codes: A13 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., August 1973. 283 p, 37 fig, 3

Descriptors: *River basin development, *Water pollution, *Computer models, *Water quality control, *Simulation analysis, Stratification, Hydraulic models, Coding, Flow charting, Manuals, Ta-bles(Data), Subroutines, Systems analysis.

EXPLORE-I, the Battelle-Northwest water quali-ty model, is a computer program which simulates the dynamic hydraulic and water quality charac-teristics of a river basin. It can be used to study the effects of various flow conditions, waste discharge, and treatment schemes on the water quality levels of lakes, reservoirs, streams, and rivers. This Programmer's Manual provides the basic programming requirements of the EX-PLORE-I codes. Included are flow diagrams, variable definition tables, program listings, and brief descriptions of the main subroutines. Portions of this document are not fully legible. (See also W79 00187) (Bell-Cornell)

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THE DETERMINATION OF QUANTITY AND QUALITY OF GREAT LAKES UNITED STATES SHORELINE ERODED MATERIAL, Michigan Univ., Ann Arbor. Sea Grant Program. E. Seibel, J. M. Armstrong, and C. L. Alexander. International Reference Group on Great Lakes

Pollution from Land Use Activities, September 1976. 46 fig, 27 tab, 137 ref, 2 append. GLBC 75D1 and EPA 68-01-1598.

Descriptors: *Great Lakes, *Erosion rates, *Sediments, *Water pollution sources, *Chemical analysis, *Shores, Lake Superior, Lake Michigan, Lake Huron, Lake Erie, Lake Ontario, Bluffs, Land use, International Joint Commission, Litoral, Waves(Water), Wind erosion, Recession rates, United States, Beach erosion, Weathering.

Annual volumetric contributions of sediment from the U.S. shoreline of the Great Lakes were esti-mated on the basis of shore recession rates for about 44% of the erodible shoreline, and chemical about 44% of the erodible shoreline, and chemical constituents of transported material were calculated. Estimates of total quantity and quality of eroded material will be included in a subsequent study. The following aspects are covered: (1) nearshore erosion processes, (2) methodology, (3) bluff recession, and (4) erosion and chemical input to the Great Lakes from the U.S. shoreline. Data clearly demonstrate that erosion varies among locations, and erosion and shore recession rates for any one point can vary significantly from average values for the particular shore form. Shore reces-sion data were obtained from various sources, and a weighted average annual, maximum annual, and minimum annual recession rate were estimated for each section of the U.S. Great Lakes shoreline for were data. The volume of material contributed from bluff recession was determined using the rectangular prism method. High annual using the rectangular prism method. High annual recession rates were found on shores of southwestern Lake Superior (exceeding three m), eastern Lake Michigan (over one m), southwestern Lake Huron, and western Lake Erie (over 1.5 m), (Lynch-Wisconsin) W79-00249

WATER QUALITY IN THE OZARK NATIONAL SCENIC RIVERWAYS, MISSOURI, Geological Survey, Rollo, MO. Water Resources

J. H. Barks.

Available from Supt. of Documents, GPO, Washington, DC 20402, Price \$3.25. Water-Supply Paper 2048, 1978. 57 p, 8 fig, 2 plates, 20 tab, 34

Descriptors: *Water pollution sources, *National parks, *Wild rivers, *Recreation facilities, *Water analysis, Nutrients, Pesticides, Bacteria, Trace elements, Aquatic environment, Missouri, *Ozark National Scenic Riverways.

During an intensive water-quality study of the Ozark National Scenic Riverways in Missouri, dissolved-solids concentrations averaged 276 mg/liter in ground water and less than 200 mg/liter in springs and streams. Calcium, magnesium, and bicarbonate constituted more than 90 percent mil-liequivalents of the total ions in the waters. Total

nitrate concentrations as nitrogen averaged 0.22 mg/liter in ground water, 0.42 mg/liter in springs, and less than 0.65 mg/liter in streams. Minor-element concentrations were generally low, but on one occasion there were anomalously high concentrations of total barium, lead, silver, and zinc in samples from Blue Spring and four stream-index stations. The only pesticides detected were 0.03 micrograms per liter of 2, 4, 5-T in the Current River. Communities and developed campgrounds exhibited no detectable influence on the quality of water in streams. However, concentrated swimming activities caused slight increases in bacteria densities, and concentrated horseback riding activities resulted in significant increases in fecal coliform and fecal streptococcus densities in the Jacks Fork. Phytoplankton, periphyton, and benthic invertebrate types and populations in the Current River and Jacks Fork indicate generally unpolluted conditions. (Woodard-USGS) quali-nulates charac-idy the waste waste water is, and les the e EX-is, vari-id brief ions of o W79-Y AND

GEOLOGY AND GROUND WATER IN DOOR COUNTY, WISCONSIN, WITH EMPHASIS ON CONTAMINATION POTENTIAL IN THE SILURIAN DOLOMITE,

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76 mg/liter mg/liter in sium, and ercent milRIAN DOLOMITE, Geological Survey, Madison, WI. Water Resources Div. M. G. Sherrill. Available from the Supt. of Documents, GPO, Washington, DC 20402, Price \$4.75. Water-Supply Paper 2047, 1978. 38 p, 13 fig. 5 plates, 5 tab, 34 ref.

Descriptors: *Groundwater resources, *Hydrogeology, *Water quality, *Path of pollutants, *Aquifer characteristics, Groundwater tryingeonsy, water quanty, rath of point ants, "Aquifer characteristics, Groundwater availability, Water level fluctuations, Ground-water availability, Water level fluctuations, Groundwater recharge, Water wells, Water yield, Aquifer management, Water supply, Hydrologic data, Wisconsin, "Door County, "Silurian dolomite.

Door County, Wis., has a long history of ground-water contamination. The problem is most severe in late summer, when tourists and fruit-canning operations generate additional contaminants. Fecal organisms from ineffective waste-disposal systems are the major ground-water contaminants. Contaminants also enter the ground-water system from agricultural, industrial, and municipal sources. Most contaminated ground water is in sources. Most contaminated ground water is in populous areas that lack sewage-treatment facilities and that are underlain by fractured bedrock at or near the surface. This report describes the geology, ground water, hydrology, and groundwater quality in Door County to provide a better basis for planning future wells. Several geologic and hydrologic factors were considered and studied. Ten bedrock wells, ranging in depth from 47 to 1,845 ft were drilled and tested by the U.S. Geological Survey. The thicknesses of unconsolidated deposits and Silurian rocks were determined, and the areal extent of the Silurian dolomite aquifer system was outlined. Chemical and bacterial ground-water quality was monitored. Ground-water and contaminant movement were determined in selected areas, and this information was used to define areas of potential ground-water contamination. (Woodard-USGS) W79-00256 W79-00256

FORMS OF TRACE ELEMENTS IN SOILS, SEDIMENTS, AND ASSOCIATED WATERS: AN OVERVIEW OF THEIR DETERMINATION AND BIOLOGICAL AVAILABILITY, Geological Survey, Menlo Park, CA. Water Resources Div

Resources Div.

Resources Div.

E. A. Jenne, and S. N. Luoma.

In: Biological Implications of Metals in the Environment: Proceedings of the Fifteenth Annual Manford Life Sciences Symposium at Richland, Washington, September 29-October 1, 1975, p 110-143, 1977. 1 fig, 2 tab, 187 ref.

Descriptors: *Trace elements, *Analytical techniques, *Surface waters, *Sediments, *Biota, *Biological communities, Aquatic populations, Geochemistry, Water temperature, Physicochemical properties, Heavy metals, Suspended solids, Organic matter, Soil chemistry, Water quality, Environment, Absorption, Solutes.

The particular physicochemical forms of trace elements in waters and sediments are of major importance in determining the biological availability of trace elements to biota. The thermodynamic activity of the uncomplexed ion is probably the single most important factor affecting the biological availability of solute trace elements. Most of the data showing a decrease in trace element assimilation, by freshwater organisms, with increasing waterhardness can be interpreted in terms of a decrease in activity of the element due to precipitation and to formation of carbonate, hydroxide, and other complexes. With some exceptions, complexation of solute trace elements by organic ligands also decreases their biological availability. Experimental evidence indicates that trace element assimilation from solid forms (sediment) by detritus ingesting aquatic organisms is dependent upon trace element form, but occurs much slower than the assimilation rate from solute forms. The biological importance of solid forms of trace elements may be principally due to their regulation of equilibrium solute concentrations in the associated waters via sorption - desorption and dissolution - precipitation reactions.

W79-00271 The particular physicochemical forms of trace ele-

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CONDITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977, Geological Survey, Tallahassee, FL. Water Pagestran Div. Resources Div. For primary bibliographic entry see Field 4A. W79-00272

MICROBIAL DEGRADATION OF DDT, Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy. For primary bibliographic entry see Field 5C. W79-00278

SAMPLING AND MODELING OF NON-POINT SOURCES AT A COAL-FIRED UTILITY, Research Corp. of New England, Wethersfield,

CT.
G. T. Brookman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-274 369, Price codes: A13 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-600/2-77-199, 268 p, Sept 1977. 11 fig, 35 tab, 4

Descriptors: "Mathematical models, "Leachate, "Coals, "Runoff, Model studies, Statistical models, Water pollution sources, Fossil fuels, Powerplants, On-site data collections, Utilities, Electric powerplants, Streams, Path of pollutants, Air pollution, *Coal powerplants, Nonpoint

The report gives results of a measurement and modeling program for non-point sources (NPS) from two coal-fired utility plants, and the impact of NPS on receiving waters. The field measurement survey included measurement of overland runoff from NPS and river sampling upstream and downstream of each plant site. NPS sampled from storm water runoff and leachate from coal storage piles and runoff from impervious areas such as parking lots and roofs which were covered with dust fallout from coal and ash handling operations. A mathematical model was developed to simulate both the quantity and quality of industrial NPS pollution and its impact on receiving waters. Field data indicated that NPS pollution from utilities had

little impact on the two rivers, compared to the impact from sources upstream of each site. Modeled results compared to field measurements within a factor of 4 for both the quantity and quality of storm water runoff and its impact on the quality of the receiving waters. (EIS-Deal)
W79-00279

A LYSIMETRIC STUDY OF WATERS IN AN IR-RIGATED PASTURE (IN RUSSIAN), Moskovskaya Akademiya (USSR). Div. of Meadow Science. For primary bibliographic entry see Field 2G. W79-00284

LABORATORY STUDY OF THE RELEASE OF PESTICIDE AND PCB MATERIALS TO THE WATE COLUMN DURING DREDGING AND DISPOSAL OPERATIONS, Envirex, Inc., Milwaukee, WI. For primary bibliographic entry see Field 5A. W79-00286

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT, Versar, Inc., Springfield, VA. F. C. Whitmore

Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-270 220, Price codes: A09 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-500/6-77-006, July 1977. 158 p, 14 fig, 43 tab, 5 app, 39 ref. NTIS PB-270 220.

Descriptors: "Polychlorinated biphenyls, "Great Lakes, "Lake Michigan, "Mathematical models, Path of pollutants, Water pollution sources, Lakes, Model studies, Statistical models, Sedi-ments, Air pollution, Water chemistry, Water analysis, Aroclors, Chemical properties,

A first order model for the sources, distribution A first order model for the sources, distribution and fate of PCBs in an aquatic system is described. The model is then applied to Lake Michigan and to the Great Lakes System. The results obtained from the model indicate that atmospheric sources are a major PCB input to the Great Lakes. Because of the great water mass of the lakes, the PCB concentration appears to be storage controlled rather than loss controlled. The major loss mechansims are found to be co-evaporation from the air-water surface interface and entrapment the air-water surface interface and entrapment with sediments. It is estimated that if all inputs of PCBs rate in Lake Michigan were eliminated, it would take more than 70 years for the concentra-tion of PCBs in the water to decrease by 50 per cent. (EIS-Deal)

MULTIMEDIA LEVELS-MERCURY, Battelle Columbus Lab., Columbus, OH.

National Technical Information Service, Springfield, VA 22161 as PB-273 201, Price codes: A07 in paper copy, A01 in microfiche Environmental Protection Agency, Report EPA-560/6-77-031, September 1977. 150 p, 18 fig, 47 tab,

Descriptors: *Mercury, Path of pollutants, Chemical analysis, Water analysis, Public health, Human pathology, Industrial wastes, Water pollution sources, Air pollution, Food habits, Food chains, Food webs, Fish physiology, Heavy metals, Geothermal studies, *Tissue analysis, *Bioaccumulation, Environmental levels.

This report is a review of environmental levels of mercury based on published reported and other information sources. Mercury levels are reported for the atmosphere, surface, and ground waters, drinking water, sediments, soils, terrestrial and

Group 5B-Sources Of Pollution

aquatic biota and man. The behavior of mercury in the environment it also discussed. Higher than ambient levels of mercury are found near mercury mines, geothermal steam fields, power plants, incinerators, sewage treatment plants, some industralized areas, and indoors where mercury is used. The release of mercury from natural sources to air and water is double the man-related losses to these media. The levels of mercury in biota are variable, depending on food habits and environmental conditions. The highest levels occur in animals at the top of the trophic structure. Mercury levels in tissues of humans are elevated in chlor-alkali industry workers, in dentists, in people from areas with natural mercury deposits, and in urban populations as compared with the rural. (EIS-Deal) W79-00291

STUDIES IN MICROBIAL CHEMOTACTIC BEHAVIOR IN SEAWATER, Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics. For primary bibliographic entry see Field 5C. W79-00293

ENVIRONMENTAL EFFECTS OF SCHUYL-KILL OIL SPILL II, JUNE 1972. Environmental Protection Agency, Washington, DC. Spills Prevention and Control Board. For primary bibliographic entry see Field 5C. W79.00245

TRACING SEWAGE EFFLUENT RECHARGE -TUCSON, ARIZONA, Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 5A.

LONGITUDINAL DISPERSION OF FLUID PAR-TICLES IN MOUNTAIN STREAMS: I. THEORY AND FIELD EVIDENCE.

AND FIELD EVIDENCE, Geological Survey of Canada, Ottawa (Ontario).

Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 7-28, 1977. 9 fig. 4 tab, 30 ref.

Descriptors: "Dispersion, "Streams, "Mountains, Streamflow, On-site investigations, Tracers, Salts, Sodium chloride, Mixing, Model studies, Theoretical analysis, Analytical techniques, Rivers, Hydraulics, Hydrology, Mountain streams, Log-nitudinal dispersion.

The longitudinal dispersion of fluid particles in mountain streams was investigated in a series of 49 experiments. Mean properties of the dispersion process were studied over a maximum downstream distance of 2,250 m, a mean relocity range of 0.32-1.57 m/s, and a mean flow width range of 2.7-21.8 m. It was shown conclusively that for distances of up to 800 mean channel widths in these steep, turbulent streams, the spread of standard deviation of an initially concentrated mass increases linearly with distance, and not as its square root as necessary for the application of conventional mixing models. Consequences of this linearity are an ever-increasing dispersion coefficient along the channel and a persistent asymmetrical concentration distribution. (See also W79-00309) (Sims-ISWS)

LONGITUDINAL DISPERSION OF FLUID PARTICLES IN MOUNTAIN STREAMS: 2. SIMILARITY OF THE MEAN MOTION AND ITS APPLICATION,

Geological Survey of Canada, Ottawa (Ontario). T. J. Day.

Journal of Hydrology (New Zealand), Vol. 16, No. 1, p 26-52, 1977. 24 fig, 2 tab, 5 ref, 1 append.

Descriptors: "Dispersion, "Streams, "Mountains, Streamflow, Mixing, On-site investigations, Tracers, Salts, Sodium chloride, Data processing, Model studies, Analytical techniques, Rivers, Hydraulics, Hydrology, Mountain streams, Longitudinal dispersion.

The mean longitudinal motion of fluid particles dispersing in mountain streams was shown, for distances up to 800 mean channel widths, to exhibit the characteristics of a self-similar process with constant velocity ratios and geometric form. Although the kinematic relations and the structure of the turbulent field were shown to be sensitive to the nature of the flow boundaries and the geometry of the channel, similarity was shown to exist for flows in a wide range of steep gravel- and boulder-bed channels. A dimensionless time-concentration curve was developed, and a method for prediction of the dispersion pattern, based upon the co-ordinates of this shape and the linearity of its scaling parameters, was presented. (See also W79-00308) (Sims-ISWS)

CHEMISTRY OF SMALL NORWEGIAN LAKES, WITH SPECIAL REFERENCE TO ACID PRECIPITATION, Norsk Inst. for Vannforskning, Blindern.

Norsk Inst. for Vannforskning, Blindern. For primary bibliographic entry see Field 5A. W79-00321

MASS BALANCE MODEL FOR CALCULATION OF IONIC INPUT LOADS IN ATMOSPHERIC FALLOUT AND DISCHARGE FROM A MOUNTAINOUS BASIN, British Columbia Univ., Vancouver. Dept. of

Geography.
L. J. Zeman, and O. Slavmaker.

Hydrological Sciences Bulletin, Vol. 23, No. 1, p 103-117, March 1978. 2 fig, 4 tab, 29 ref.

Descriptors: *Watersheds(Basins), *Fallout, *Canada, *Model studies, *Precipitation(Atmospheric), Ions, Cations, Discharge(Water), Mountain forests, Data collections, On-site investigations, Mountains, Surface waters, Chemical analysis, Water pollution, Statistical methods, Data processing, Sodium, Potassium, Calcium, Magnesium, Bicarbonates, Sulfates, Phosphates, Hydrogen ion concentration, *British Columbia, Mass balance, Pristine forests.

A mass balance model was designed to determine the contribution of ionic loads in atmospheric fallout to discharge from a pristine forested mountainous basin in British Columbia. Input to the model consisted of measurements of weekly precipitation amounts (mm) and ionic concentra tions (mg/1) in bulk fallout on 4 elevation zones of an experimental basin. Output data consisted of instantaneous hydrometric measurements, expressed in flow units per basin area (mm) and ionic concentrations (mg/1) measured in weekly intervals at the basin outlet. The weekly data on volume weighted ionic concentrations in bulk fallout and discharge were used for calculation of monthly ionic loads (kg/ha/month) and their monthly input-output balances. The annual loads (kg/ha/yr) in bulk fallout and discharge as well as the annual input-output balance were determined from the monthly loads. Implication of the hydrochemical balance for precipitation and stream chemistry variations, weathering, erosion, and denudation rates in a perhumid moutainous basin in coastal British Columbia was discussed. The model is sufficiently general in its design to be used for the assessment of hydrochemical input applicability is particularly evident for systems in which classical dissolved solids concentration-discharge relationships are highly variable over space and time. (Humphreys-ISWS) W79-00328 output budgets in any moutainous basin unit. Its CHANGES IN INTERSTITIAL WATER SALINI-TY OF A MISSISSIPPI TIDAL MARSH, Missisrippi State Univ., Mississippi State. Dept. of Zoology. For primary bibliographic entry see Field 2L.

WATER -- 1977. American Inst. of Chemical Engineers, New York, For primary bibliographic entry see Field 5D. W79-00342

MODELING AND MONITORING OF TOXIC SPILLS AND TOXIC EFFLUENTS, Research Corp. of New England, Wethersfield, CT.

R. E. Kenson.
Available from Copyright Clearance, Inc., New
York, NY as 0065-8812-78-9861-0178 (\$0.95). In:
Water -- 1977, AIChE Symposium Series, Vol. 74,
No. 178, edited by G. F. Bennett, p 1-5, 1978, 3 fig,
2 tab, 4 ref.

Descriptors: "Water pollution, "Toxicity, "Effluents, "Monitoring, "Model studies, "Pollutant identification, Analytical techniques, Pollutants, Mass spectrometry, Gas chromatography, Colorimetry, Absorption spectroscopy, Absorption, High pressure liquid chromatography.

Various approaches to solving practical water pollution problems are evaluated with emphasis on monitoring and modeling of toxic effluents. Definition of the problem is the first, most important, step before deciding on the course of action to be pursued. This is recommended even in crisis situations where immediate action is being demanded. Monitoring techniques which aid in defining a toxic pollutant problem include: gas chromatography/mass spectroscopy which has proved effective for most volatile organic pollutants; atomic absorption which is used for metals after they have been chelated and extracted from solution; and colorimetric analysis and specific ion electrode methods which may be preferred for specific chemicals, such as fluorides, phenols, and cyanides. Caution is advised in using gas chromatographic methods along without corroboration because it can be misleading. For components of low volatility, the use of high pressure liquid chromatography is recommended as an attractive alternative. Predictive mathematical modelling techniques are described as an effective supplement to sampling/analysis but caution is advised here, too. Factors that should be considered in evaluating a modelling study are: (1) accuracy of the volume and release rate data of the pollutant; (2) solubility and specific gravity of the toxic pollutant; (3) validity of the model for application. (See also W79-00342) (Majtenyi-IPA)

APPLICATION OF EXCHANGE/ADSORPTION MODELS TO VIRUS TRANSPORT IN PERCOLATING BEDS, California Univ., Los Angeles.
For primary bibliographic entry see Field 5D. W79-00355

MODELLING THE WATER QUALITY OF THE HYDROLOGICAL CYCLE.
Proceedings of the Baden Symposium, September 1978, convened jointly by IIASA and IAHS. IAHS-A1SH Publication No. 125, Office of Treasurer, IAHS, 1909 K Street NW, Washington, DC., 1978. (383 p.) 155 fig, 48 tab, 397 ref.

Descriptors: *Water quality, *Mathematical models, *Water management(Applied), *Optimization, *Simulation analysis, *Analytical techniques, *Hydrologic cycle, Rivers, Lake, Reservoirs, Estuaries, Economic efficiency, Systems analysis, Equations, Hydraulics.

SALINI-Dept. of T.

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nc., New 0.95). In: , Vol. 74, 978, 3 fig.

Toxicity. studies, chniques, cromatogtroscopy tography

water polphasis on effluents. ost imporof action n in crisis being de-d in defingas chro-as proved collutants; ecific ion ferred for gas chro-

onents of quid chro-ctive altermodelling ve supp is advised sidered in ccuracy of pollutant; toxic polpplication.

ION G BEDS. d 5D.

Y OF THE September and IAHS. ce of Trea-

thematical t(Applied), Analytical ers, Lake, efficiency,

Important progress has been made in recent years in the application of systems methodology to modeling the quality of water in the hydrological cycle. Many papers on these problems have been presented at various international symposia and seminars, such as those held in Warsaw (1971), Bratislava (1975), and Amsterdam (1977. Hydrophysical and ecological modeling of water bodies, as well as a survey on water quality modeling, are part of the research program of the International Institute for Applied Systems Analysis (IIASA) in Laxenburg, Austria. Modelling the Water Quality of the Hydrological Cycle is the proceedings of an international symposium convened jointly by IIASA and IAHS (The International Association of Hydrological Sciences), due to the increasing interest in this subject. Held in Baden, Austria during September of 1978, over 30 papers were delivered, covering the following fields: (1) modeling water quality processes in lakes and reservoirs; 83) modeling groundwater quality processes; and (4) water quality management. Numerous physical simulation modeling techniques and economic optimization methods are presented. Dealt with are such problems as those concerning waste water treatment, activated sludge, water quality control, inter-basin transfer, water networks, water resources development, streamflow forecasting, mocropollutant transport, two-dimensional mixing, eutrophication, shallow water bodies.

STORMWATER MODELING, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
D. E. Overton, and M. E. Meadows. Academic Press, New York, N.Y., 1976. 358 p, 171 fig, 66 tab, 203 ref, append.

Descriptors: "Storm water, "Model studies, "Analytical techniques, "Parametric hydrology, "Stochastic processes, "Water pollution, "Kinetics, "Deterministic modeling, Rainfall, Overland flow, Open channel flow, Estimating, Regional analysis, Effects, Urbanization, Evaluation, Estimating, Simulation analysis, Optimiza-tion, Sensitivity analysis, Wave theory, Equa-tions, Systems analysis.

Presented are the fundamentals of deterministic, Presented are the fundamentals of deterministic, parametric, and stochastic stormwater modeling for those having a basic background in science or engineering. The book was written for an audience concerned primarily with evaluating the effects of land use on stormwater for the purpose of doing feasibility studies, planning, and/or design work. A view is given of present methodologies with illustrative examples. The book considers both quantity and quality, but the focus is mainly on stormwater pollution, and so it is stressed that the transport mechanism for water pollutants is the water itself. After an introduction and discussion of modeling concepts, the section on deterministic modeling considers such aspects as rainfall exmodeling considers such aspects as rainfall excess, overland and open channel flow, and kinematic flow approximation and wave theory.
Discussed next, under parametric modeling, are
model optimization techniques, sensitivity analysis, and the evaluation of effects of urbanization
and logging on stormwater and of strip mining on
streamflow. The stochastic section deals with
stormwater frequency modeling. Discussed
finally, under stormwater quality modeling, are
the state of the art in stormwater quality modeling,
simulating pollutographs and loadographs, and the
development of stormwater quality indices. (BellCornell)
W79-00381 modeling considers such aspects as rainfall ex-W79-00381

TRANSPORT CHARACTERISTICS OF PHOSPHORUS IN CHANNELIZED AND MEAN-DERING STREAMS,
Everglades National Park, Homestead, FL.
P. C. Rosendahl, and T. D. Waite.

Water Resources Bulletin, Vol. 14, No. 5, p 1227-1238, October 1978. 4 fig, 1 tab, 7 equ, 20 ref.

Descriptors: *Nutrients, *Mathematical models, "Water quality, "Orthophosphate,
"Channelization, "Meandering streams,
"Kissimmee River Basin(Fla), Equations, Movement, Canals, Runoff, Effects, Numerical techniques, Mathematical transport model, Steady
state, Simulation analysis.

Comparisons were made between rates of movement of orthophosphate in a canal and a meandering stream. The meander system had greater algal and macrophyte phosphate uptake rates and lower plankton and sediment release rates compared to the canal. Chemical precipitation and direct rainfall influence on orthophosphate movement were insignificant relative to other terms. The major source of phosphorus to both systems was from upland runoff. The impact of this source was greater on the meandering system due to the smaller channel volume. When secondary effects of meandering were considered such as marsh insmaller channel volume. When secondary effects of meandering were considered such as marsh inundation, the net orthophosphate movement within the meandering channel was less than that for the canel, due to the lower concentrations of phosphorus in marsh effluent waters. Field experiments were conducted to compare the longitudinal dispersion coefficient between a canal and meandering river system; the meandering stream had a dispersion coefficient over 17 times that measured for the canal. Rates of orthophosphate movement were combined into a single mass transport equa-tion, and a numerical solution was obtained. Internal river and canal channel processes were overshadowed by external point source loadings. (Bell-Cornell)

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTA-

TION REPORT, Battelle Pacific Northwest Labs., Richland, WA. W. W. Waddel, C. R. Cole, and R. G. Baca. Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 923, tion Service, springhen, vA 22161 as 19-20-22, Price codes: A05 in paper copy, A01 in microfiche. Prepared for Environmental Protection Agency, Washington, D.C., Office of Research and Monitoring, April 1974. 87 p, 62 fig. 10 tab, 10 ref, ap-

Descriptors: *Water quality control, *Simulation analysis, *Computer models, *Behavior, *Water pollution sources, *South Platte River Basin(Colorado), Phosphorus, Coliform bacteria, Nitrogen, Biochemical oxygen demand, Algac, Dissolved, Prediction, Dissolved gases, Streamflow, Regression analysis, Winter, Data.

The water quality model PIONEER-I is a steady-state program that simulates the behavior of the following water quality parameters: total aitrogen, total dissolved solids, zinc, dissolved oxygen, carbonaceous biochemical oxygen demand, fecal coliform bacteria, phosphorus, ammonia, nitrite, nitrate, and chlorophyll a. The model was set up on the entire length of the South Platte River from Eleven Mile Canyon Reservoir to its confluence with the North Platte River. In addition, ten major with the North Platte River. In addition, ten major tributaries to the South Platte and a number of smaller streams were modeled. The model was calibrated using flow and water quality data collected on the river in late summer 1971 and winter 1971-72. The model was successfully calibrated to describe dissolved oxygen-biochemical oxygen demand mechanisms and nutrient distributions. Study results have shown that it is practicable to set up and calibrate a mathematical water quality model which considers numerous interactive conmodel which considers numerous interactive con stituents on a large and complex river basin such as the South Platte. It is recommended that every effort be made to encourage the use of this model by regional and local agencies and groups; it is only through this kind of repeated and continuous use that the model can be refined and developed

into a reliable and trusted tool for water resource managers. (Bell-Cornell) W79-00398

CHARACTERIZATION OF THE RELEASE OF CHRYSOTILE ASSESTOS FROM ASSESTOS-CEMENT DRINKING WATER PIPE, Illinois Univ. at the Medical Center, Chicago.

W. H. Hallenbeck, Jr. W. H. Hallenbeck, Jr. Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 087, Price codes: A04 in paper copy, A01 in microfiche. PhD Dissertation, 1977. 49 p, 2 fig, 15 tab, 47 ref. OWRT A-071-ILL(3).

Descriptors: "Asbestos cement, "Potable water, "Pipes, Sampling, "Asbestos, Electron microscopy, Lake Michigan, Illinois, Filtration, Water pollution sources, On-site investigations, "Chrysotile,

A significant problem in data analysis involved the determination of the distribution of counts of asbestos fibers on a membrane filter. The elucidaasbestos fibers on a membrane filter. The elucida-tion of this distribution as Poisson enabled the parametric statistical comparison of 'before' to 'after' water samples. Under the conditions and limitations of this research, no significant release of chrysoltile from asbestos-cement pipe was ob-served. Preliminary data indicate that drinking water in northeast Illinois may contain chrysotile asbestos ranging from 30,000 to 700,000 fibers per liter. W79-00435

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT, Tennessee Univ , Knoxville. Dept. of Civil Engineering. For primary bibliographic entry see Field 5G. W79_00447

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTEE POPPETED

WATERSHED,
Kentucky University, Lexington, Water
Resources Research Institute. G. B. Coltharp, M. T. Shearer, E. P. Springer, and

R. F. Wittwer.

R. F. Wittwer.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 171, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 115, 1978. 67 p, 13 fig. 14 tab, 27 ref. OWRT A-058-KY(1), 14-31-0001-5017 FY 75, 14-34-0001-6018 Fy 76, 14-34-0001-7038 FY 76T, 14-34-0001-7038 FY 77.

Descriptors: "Water quality, Fertilization, "Nutrient cycling, "Nitrate nitrogen flux, Streamflow, "Forest watersheds, Watershed management.

This project was designed to determine the effects of aitrogen fertilization on the quality and quantity of streamflow eminating from an eastern hard-wood forest watershed. A 40.67 ha watershed, located in mountainous eastern Kentucky, was located in mountainous eastern Kentucky, was aerially fertilized in late April 1975. The forest stand was principally oak, hickory, and yellow poplar, 50-55 years of age in a relatively undisturbed condition. A helicopter applied ammonium nitrate at a rate of 504 kg/ha. Because a large part of applied nitrogen fertilizer ends up in the highly mobile nitrate nitrogen form, this is the principal ion monitored in this study. No effort was made to avoid live streams during application and, consequently, very high levels of nitrate nitrogen were detected (640 mg/l) in streamflow within the watershed. Levels notentially toxic to within the watershed. Levels potentially toxic to humans and animals persisted in the streamflow for several days following application. Although elevated concentrations of nitrate nitrogen per-sisted in streamflow leaving the watershed over a

Group 5B-Sources Of Pollution

two year period no algal blooms or excessive growth of aquatic plants were noted. Rather high concentrations of nitrate nitrogen were found in the soils of the watershed, with greatest concentrations in the surface layer (0-5cm), intermediate amounts at 15-20cm, and the lowest concentrations at the 41-46cm depth. The effects of the fermilling amounts are sufficient to the concentrations at the 41-46cm depth. The effects of the fermilling amounts are sufficient to the concentrations at the 41-46cm depth. The effects of the fermilling amounts are sufficient to the concentrations at the 41-46cm depth. tilizer application on soils persisted less than one year in the 0-46cm depth sampled. Analysis of yield the first and second growing seasons after treatment. streamflow records indicated a reduction in water W79-00448

1

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS, Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Deartment. partment.
For primary bibliographic entry see Field 4C.

FACTORS AFFECTING THE QUALITY OF IIRBAN RUNOFF IN FOUR WATERSHEDS URBAN RUNOFF IN FOUR WATERSHEDS WITHIN THE CITY OF KNOXVILLE, TENNES-SEE.

Tennessee Univ., Knoxville. Dept. of Civil Engineering. R. S. Brown

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 148, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, June, 1977. 84 p, 14 tab OWRT A-046-TENN(1), 14-34-0001-7090

Descriptors: *Urban runoff, Watersheds(Basins), *Water quality, *Urban watersheds, Knox-ville(Tenn), *Tennessee, Path of pollutants, Third Creek/watershed, Runoff, *Stormwater.

Results of the analysis of 5 years of stormwater data from 4 urban watersheds indicated that there are two distinct but overlapping groups of con-taminants. One group is the minerals and solids which have relatively constant concentrations from storm to storm and heavy metals, nutrients and COD which have decreasing concentration with increasing runoff. Removal is a function of runoff volume and only mildly affected by runoff rate. Pervious areas should not be disregarded in stormwater quality simulation. Hence street sur-face contaminant models will yield conservative results. It was also found that dustfall (total atmospheric fallout) could account for most of the stormwater pollution W79-00456

LEACHING CHARACTERISTICS OF VARIOUS HEAVY METALS, NON-HEAVY METALS AND ANIONS FROM MUNICIPAL SEWAGE SLUDGE ASH.

Connecticut Univ., Storrs.

C. D. Sweeney. Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 086, Price codes: A07 in paper copy, A01 in microfiche. M.S. Thesis, 1978. 128 p, 38 fig. 18 tab, 10 append, 59 ref. OWRT A-067-CONN(1). 14-34-0001-8007.

Descriptors: "Municipal wastes, "Incinetation, "Sludge disposal, "Lagoons, "Leaching, "Heavy metals, "Anions, Chemical properties, Soil contamination, Groundwater, Water pollution sources, "Municipal sewage sludge incinerator Descriptors: *Municipal wastes, *Incineration, tamination, Groundwater, Water pollution sources, "Municipal sewage sludge incinerator ash, "Leaching characteristics, "Landfills, Batch studies, "Lysimeter studies, pH variation.

Qualitative and quantitative leaching characteristics of unquenched municipal sewage sludge incinerator ash were studied with respect to amount of water applied and pH variation. Chemical digestion by wet decomposition of unquenched ash showed high residual concentrations of magnesium, sodium, calcium and potassium. Iron was contained in the highest residual concentration of all heavy metals monitored, with zinc second and chromium, cobalt, copper, manganese, nickel and lead present in lower concentrations. Batch and lysimeter studies were used to examine the cluting of the above cations out of the ash and into the water. In addition sulfur, nitrate and chloride were monitored with sulfate having the highest concentrations. Lysimeter effluent analysis revealed basically similar types of 'immediate washing out' curves for both cations and anions with the excep-tion of calcium, which remained in relatively higher concentrations for a longer period of time before its concentration declined. There were no major secondary peaks in any of the effluent profiles. Batch results paralleled lysimeter results with respect to changes in characteristic effluent concentrations. In addition, batch studies gave indirect information on the ability of the ash to buffer an initially acid effluent.

ARCADIA LAKE WATER-QUALITY EVALUA-TION,

Army Engineer Waterways Experiment Station, Vicksburg, MS. Environmental Effects Lab. For primary bibliographic entry see Field 5C.

TOTAL PHOSPHORUS TRANSPORT DURING STORM EVENTS

West Virginia Univ., Morgantown. Dept. of

Chemical Engineering.
F. H. Verhoff, and D. A. Melfi.
Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE5, Technical Note, p 1021-1026, October 1978. 3 fig, 3 ref.

Descriptors: *River flow, *Phosphorus, *Water chemistry, *Model studies, Mathematical models, Flow, Flow rates, Chemicals, Pollutants, Path of pollutants, Water pollution, Storms, Storm runoff, Rivers, Hydrographs, Chemical concentrations

The flow of water and total phosphorus was simu-Ine tow of water and total phosphorus was simulated in a stream with different types of total phosphorus transport mechanisms. The results of the simulations were compared with known properties of observed hydrographs and chemographs. It was concluded that the major mechanism required to explain the observed results is one that postulates the resuspension and deposition of total phosphorus from the reaches of the river. Thus, most of the total phosphorus the river. Thus, most of the total phosphorus moves through a river reach by moving a finite distance with each high flow event passing through the river. (Sims-ISWS) W79-00478

SIMPLE MODEL FOR OCEAN OUTFALL PLUMES

General Dynamics Corp., Pomona, CA. H. C. Schau

Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. EE5, Technical Note, p 1026-1031, October 1978. 3 fig, 8 ref, 1 append.

Descriptors: *Outfall sewers, *Sewage disposal, *Oceans, *Mathematical models, Jets, Outlets, Theoretical analysis, Model studies, Buoyancy, Mixing, Distribution patterns, Spatial distribution, *Outfall plumes.

Ocean outfall systems provide many coastal communities with an economical means of sewage disposal that requires only primary sewage treat-ment. It is desired to have the effluent as dilute as ment. It is desired to have the efficient as diduce a possible when it reaches the surface. It is known that the amount of mixing is generally affected by the mass flow rate at the outfall system exit, depth, and upward velocity of the effluent (that is a function of exit velocity and density stratification in the seawater). It was the desire of this study to provide some working functional relationships

between these parameters in the prediction of difu-tion in an ocean outfall system. The study centered around a model which assumes that the entrain-ment is uniquely related to the local excess mo-mentum flux. It was shown that a power law model provides a simple technique for predicting the dilu-tion as a function of depth, for depths characteristic of most outfall systems (20 ft to 200 ft). In particular, it was found that for depths greater than 20 ft, the dilution varies as the 5/3 power of the depth and initial mass flow rate has to first order an additive effect to the solutions given for m sub o = 0. Such solutions are accurate to better m sub o = 0. Such solutions are accurate to better than 5% on the average and are meant to augment the results of Fan and Brooks and to provide the working engineer with a simple method for per-forming preliminary studies without elaborate nu-merical or graphical solutions. (See also W69-08424) (Humphreys-ISWS) W79-00479

RELATIONSHIP OF RAINFALL AND LAKE

GROUNDWATER SEEPAGE, McGill Univ., Montreal (Quebec). Dept. of Biolo-

gy. J. A. Downing, and J. J. Peterka. Limnology and Oceanography, Vol. 23, No. 4, p 821-825, July 1978. 1 fig, 1 tab, 9 ref.

Descriptors: *Rainfall, *Lakes, *Groundwater movement, *Seepage, Nutrients, Nitrogen, Nitrogen compounds, Phosphorus, Phosphorus compounds, Groundwater, Recharge, Ground-water recharge, Natural recharge, Specific con-ductivity, Chlorides, Alkalinity, Sampling, Sur-veys, Chemical analysis, Limnology, Ground-water inflow. Descriptors: *Rainfall, *Lakes, *Groundwater

Correlations were found between mean daily rainfall and groundwater inflow rate and between the rate of groundwater inflow and N and P inflow to a senescent lake during summer. A simple method of collecting and measuring groundwater inflow was reproducible at very low inflow rates. The water collected by this method was similar in P concentration to groundwater, but higher in N concentration. (Sims-ISWS) W79-00489

CONTINUOUS SIMULATION OF NONPOINT POLLUTION,

Ramlit Associates, Berkeley, CA. Y. J. Litwin, and A. S. Donigian, Jr. Journal Water Pollution Control Federation, Vol. 50, No. 10, p 2348-2361, October 1978. 9 fig, 26 ref.

Descriptors: "Water pollution, "Water pollution sources, "Sediments, "Model studies, Mathematical models, Simulation analysis, Computer models, Land use, Planning, Runoff, Water quality, Pollutants, Path of pollutants, Analytical techniques, "Nonpoint pollution, Nonpoint water pollution sources.

urate information about the characteristics and the magnitude of nonpoint pollution sources is difficult to establish because (1) pollution varies by orders of magnitude from one watershed to other and from one storm to the next; (2) quantitative information about nonpoint pollution scarce; and (3) the reported surveys are often in-compatible in sampling procedures, analytical techniques, and measured parameters. This paper reviewed briefly the various modeling techniques available for the assessment of nonpoint pollution and discussed their limitations as analytical tools. The recently developed Nonpoint Source Pollu-tant Loading (NPS) Model was presented. It is based on continuous simulation of hydrologic processes and mechanisms of pollutant accumula-tion, generation, and transport from the land surce. (Sims-ISWS) 79-00493

5C. Effects Of Pollution

NUTRIENT LOADING/LAKE TROPHIC CON-DITION RELATIONSHIPS WITH SPECIAL REFERENCE TO THE INFLUENCE OF FLUSH-ING RATE, Maine Univ. at Orono.

Maine Univ. at Orono.

M. L. Hutchins.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 644,

Price codes: A05 in paper copy. A01 in microfiche.

M.S. Thesis, May 1977. 93 p, 24 fig. 2 tab, 44 ref., 7 append. C-7232(6230)(1). 14-34-0001-6230.

Descriptors: Biomass, Chlorophyll, Lakes, *Phosphorus, Secchi disks, Washouts, *Trophic level, *Model studies, *Eutrophication, Water pollution effects, Algal growth kinetics, *Flushing rate, *Nutrient loading, *Trophic state models.

A nutrient loading/lake trophic state model was developed into which algal growth kinetics were incorporated. Contrary to many past lake modeling efforts, this work described in-lake biomass concentrations instead of in-lake total phosphorus concentrations. The use of growth kinetics allowed flushing rate to become an important parameter for defining lake trophic state. For a given volumetric phosphorus loading, a critical flushing rate was identified beyond which lake washout was predicted to occur. For a phosphorus input concentration of 0.010 g/m3, washout was predicted to occur at a flushing rate of about 45 year-1. The exact value of critical flushing rate was influenced by the values of the kinetic parameters, the maximum specific growth rate, and the half-saturation constant. At low flushing rates obto lake biomass and in-lake total phosphorus could be used equally well as indicators of lake trophic state. At high flushing rates, however, biomass was found to deviate substantially from total phosphorus; thus biomass was total phosphorus. Because of this, it is anticipated that biomass will provide a better correlation between seechi disc and chlorophyll a. In application, the model defines actual lake trophic state equally as well as some previous models and, in addition, it has the capacity to describe lake washout conditions.

W79-00001 A nutrient loading/lake trophic state model was developed into which algal growth kinetics were

DEVELOPMENT OF A MANOMETRIC FISH BIOASSAY TECHNIQUE FOR WATER POLLU-

TION,
Tennessee Technological Univ., Cookeville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5A.
W79-00008

EFFECTS OF MUNICIPAL SEWAGE EF-FLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS, State Univ. of New York at Syracuse. Coll. of En-vironmental Science and Forestry. J-P. Moreau.

J-P. Moreau.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-287 596, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, April 1977. 76 p, 9 fig, 3 tab, 78 ref, 9 append. OWRT B-048-NY(3).

Descriptors: *Waste water irrigation, Effects, *Earthworms, *Trace metals, Effluents, Municipal wastes, Soil organisms, Soil profile, Research, Projects, Evaluation, Ecosystems, Biological systems, Food chains.

Specific study objectives include: (1) to determine specific study objectives include: (1) to determine the effect of wastewater irrigation on the concentration of trace metals (Cd, Cu, Pb, Zn) in earthworms collected from three different habitats--an old field community, a reed canary grass field, and a mixed oak hardwood forest; and (2) to determine the effect of wastewater irrigation

on the ratio of organic carbon to nitrogen in the soils of the three different vegetative habitats. Spray-irrigation of treated municipal wastewater is a viable alternate method of disposal. Recent investigations at Pennsylvania State University have shown that effluent irrigation increased populations of earthworms while suppressing populations of other soil organisms. On irrigated sites, earthworms may be performing a vital role in the decomposition of organic matter in the soil profile. Therefore, the assessment of any toxicological problems detrimental to this group of animals is of major importance. Examined herein is the effect of trace metals contained in the applied sewage effluent and the resultant metal content of the earthworms.

THE EFFECTS OF HEAVY METALS ON ALGAE POPULATIONS IN A SOUTH CENTRAL RESERVOIR, Arkansas Univ., Fayetteville. Dept. of Botany and

Bacteriology.

Bacteriology.
R. L. Meyer.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 829.
Price codes: A06 in paper copy, A01 in microfiche.
Arkansas Water Resources Research Center,
Fayetteville, Completion Report, Pub No 61, 1978.
90 p, 3 tab, 33 fig, 79 ref. OWRT A-041-ARK(1).

Descriptors: "Heavy metals, "Algae, Reservoirs, "Seasonal, Lakes, "Arkansas, "Lake Fayet-teville(Ark), "Trace elements, Iron, Manganese, Cobalt, Copper, Lead, Zinc, Nutrients, Systematics, Water pollution effects.

This investigation examines seasonal variations of algal assemblages in Lake Fayetteville, in an attempt to evaluate the role of various trace elements in relation to these seasonal variations. Iron, manganese, cobalt, copper, lead, and zinc concentrations were evaluated from March, 1976 to March, 1977 with concomitant examination of algal assemblages. Also, correlations between specific taxa and metals in the water fraction were evaluated. A detailed literature review dealing with the role of micronutrients in various algal with the role of micronutrients in various algal groups has been discussed, further evaluation and amplification of data and additional physicochemical parameters, are presented. W79-00011

ECOLOGICAL SYSTEM AND METHOD, For primary bibliographic entry see Field 5G. W79-00021

AQUATIC BIOTAL MONITOR, Tereco Corp., College Station, TX. (Assignee). For primary bibliographic entry see Field 5A. W79-00033

UPTAKE AND FATE OF DI-2-ETHYLHEXYL PHTHALATE IN AQUATIC ORGANISMS AND IN A MODEL ECOSYSTEM, Illinois Univ. at Urbana-Champaign Dept. of

Zoology and Entomology.

For primary bibliographic entry see Field 5B.

W79-00061

ACUTE AND CHRONIC ORAL TOXICITY OF CHLROINATED DIBENZOFURANS TO SAL-

MONID FISHES,
Fisheries and Marine Service, St. Andrews (New
Brunswick). Biological Station.
V. Zitko, D. J. Wildish, O, Hutzinger, and P. M. K.

Environmental Health Perspectives, Experimental Issue, No. 5, p 187-189, 1973. 2 fig, 3 tab, 5 ref.

Descriptors: "Toxicity, "Mortality, "Atlantic sal-mon, "Brook trout, Juvenile growth stage, Orgaic compounds, Polychlorinated biphenyls, Aroclors,

Fish physiology, Path of pollutants, Chemical properties. Gas chromatograhy, *Dibenzofurans, *Tissue analysis, Bioaccumulation, *Toxicity test-

A median mortality of 120 + or - 30 days occurred among juvenile Atlantic salmon, fed dry fish food containing 2.7, 5.7, 2.8, and 9.1 Microg/g wet weight of 2.8-di-, tri-, tetra- and octachlorodibenzofuran respectively. Only octachlorodibenzofuran was detected in the dead fish. The fate of the lower chlorinated dibenzofurance. rans was not known and additional experiments, described in this paper, were carried out with immature brook trout (ed relatively high levels of 2,8-dichlorobenzofuran. (EIS-Deal) W79-00062

THE TOXICITY OF PHTHALATES TO THE MARINE DINOFLAGELLATE GYMNODINIUM BREVE, Texas A and M Univ., Galveston. Dept. of Marine

W. B. Wilson, C. S. Giam, T. E. Goodwin, A.

Aldrich, and V. Carpenter.
Bulletin of Environmental Contamination and
Toxicology, Vol. 20, p 149-154, 1978. 7 tab, 3 ref.

Descriptors: *Toxicity, *Gymnodinium, Dinoflagellates, Aquatic algae, Organic compounds, Chemical properties, Marine algae, Acids, Chemical analysis, Mortality, Hydrogen ion concentration, *Phthalates, *Toxicity testing, *Esters, Red-tide.

The acute toxicity levels of seven phthalate com-pounds to Gymnodinium breve (the fish-killing blooms of which are popularly known as 'red tide') were determined by subjecting culture portions of this organism to various concentrations of these compounds. The compounds tested were dimethyl phthalate (DMP), din-butyl phthalate (DBP), di-ethyl phthalate (DEP), di-(2-ethylhexyl) phthalate (DEHP) di-n-propyl phthalate (DPP), potassium hydrogen phthalate and phthalic acid, disodium salt. TLM96 and EC30 data were reported for DEP, DPP, DBP, and DMP. (EIS-Deal)

THE TOXICITY OF MANGANESE ETHYLENEBISDITHICCARBAMATE TO THE ADULT NEWT, TRITURUS CRISTATUS, Milan Univ. (Italy). Lab. di Zoologia.
N. P. Zaffaroni, E. Arias, G. Capodanno, and T.

Zavanella.

Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 261-267, 1978. 3 fig, 1 tab, 6

Descriptors: "To xicity, "Newts, "Fungicides, Organic compounds, Chemical properties, Path of pollutants, Amphibians, Animal pathology, Animal physiology, Animal metabolism, Respiration, Cytological studies, Mortality, Biological membranes, "Tissue analysis, Manganese ethyledisdithiocarbamate, Mameb.

The toxicity of ethylenebisdithiocarbamate (maneb), a widely used agricultural fungicide, to the adult newt was evaluated after percutaneous exposure. Maneb was lethal to all the animals at the 50 ppm level within fifteen days. Male newts seem to be less resistant to the toxicant than females. At concentrations as low as 25 ppm all males died within 25 days, whereas some of the females were still alive after 5 months. Microscopic examination showed that the skin and the kidfemales were still alive after 5 months. Microscopic examination showed that the skin and the kidney were the most severely affected organs. It has been hypothesized that an osmoregulatory breakdown and an impairment of cutaneous respiratory exchanges play a role in the death of the animals. Renal failure must also be taken in account. However, additional mechanisms can not be ruled out excessed. (EIS.Dea) at present. (EIS-Deal) W79-00064

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Group 5C-Effects Of Pollution

TOXICITY OF THE FUNCICIDE CAPTAN TO THE DUNGENESS CRAB CANCER MAGISTER, Oregon State Univ., Newport. Dept. of Fisheries and Wildlife.

and wildite. R. S. Caldwell, D. A. Armstrong, D. U. Buchanan, M. H. Mallon, and R. E. Millemann. Marine Biology, Vol. 48, p 11-17, 1978. 5 fig, 2 tab,

14 ref.

Descriptors: *Crabs, *Toxicity, *Fungicides, *Pesticide toxicity, Larval growth stage, Growth stages, Mortality, Animal metabolism, Animal physiology, Organic compounds, Water pollution effects, Path of pollutants, Chemical properties, Degradation(Decomposition, Bioassay, Life history studies, *Toxicity testing, *Captan

Because of the relatively low toxicity of captan to crab stages and its high rate of degradation in sea-water, it is suggested that the agricultural applicaon of captan near marine waters is not li affect natural crab populations or crabs in laboratory culture. Furthermore, the prophylactic use of captan as a fungicidal treatment for Lagenidium sp. in larval crab cultures is considered safe when used at recommended dosages. (EIS-Deal)

STUDIES ON THE PATHWAYS AND EFFECTS OF CADMIUM IN CONTROLLED ECOSYSTEM ENCLOSURES.

Univ. (West Germany). Inst. fuer Meerekunde

For primary bibliographic entry see Field 5B.

UPTAKE OF AMERICUM-241 BY ALGAE AND

Savannah River Ecology Lab., Aiken, SC For primary bibliographic entry see Field 5B.

ECOLOGY OF DREISSENA POLYMORPHA (PALL.) (DREISSENIDAE, BIVALVIA) IN LAKES RECEIVING HEATED WATER DISCHARGES,

Polish Academy of Sciences, Poznan (Poland). Inst. of Applied Zoology.

S. Kornobis.

Polskie Archiwum Hydrobiologii, Vol. 24, No. 4, p 531-545, 1977. 7 fig, 4 tab, 22 ref.

Descriptors: *Mollusks, *Heated water, *Animal populations, Ecology, Lakes, Population, Biological communities, Water pollution effects, Water temperature, Plankton, Larvae, Larval growth stage, Growth rates, Animal physiology, Trophic level, Biomass, *Thermal pollution, *Dreissena.

Investigations on the ecology of Dreissena polymorpha were carried on from 1973 to 1975 on a complex of heated lakes situated in the neighborhood of Konin in Wielkopolska. It was found that the population from heated lakes shows many changes in relation to the ordinary ones. The main differences are: shallow occurrence of the population in the heated lakes; prolongation of larvae oc-currence in the plankton; distinct differentiation of the growth rate of the sedentary specimens in relation to the occurrence site; and in the shortening of life of sedentary specimens. Some fragmentary observations concerning the role of D. polymorpha in trophic relations in the heated lakes are also presented. (EIS-Deal) W79-00068

CONTINUOUS STANDARD WATER DELIVERY SYSTEM FOR BIOASSAYS WITH AQUATIC ORGANISMS,

Rijksinstituut voor Drinkwater-voorziening, Leidschendam (Netherlands).

For primary bibliographic entry see Field 5A. W79-00073

ADAPTATIONS AND RESISTANCE TO ANOXIA CLOEON DIPTERUM
(EPHEMEROPTERA) AND NEMOURA
CINEREA (PLECOPTERA),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
For primary bibliographic entry see Field 5G.
W79-00076

TRANSURANIC NUCLIDES IN PLAICE (PLEURONECTES PLATESSA) FROM THE NORTH-EASTERN IRISH SEA, Ministry of Agriculture, Fisheries and Food, Lowestoft (England). Fisheries Radiobiological

For primary bibliographic entry see Field 5B. W79-0007

SODIUM PEN NA-PCP) TO THE OF TACHLOROPHENATE (NA-PCP) TO THE GRASS SHRIMP, PALAEMONETES PUGIO, AT DIFFERENT STAGES OF THE MOLT CYCLE, University of West Florida, Pensacola. Faculty of TACHLOROPHENATE

Bulletin of Environmental Contamination and Toxicology, Vol. 20, p 275-279, 1978. 1 tab, 18 ref.

Descriptors: *Toxicity, *Shrimp, *Sodium com-pounds, *Chlorinated hydrocarbon pesticides, *Pesticide toxicity, Growth stages, Organic com-pounds, Phenols, Crustaceans, Bioassay, Animal physiology, Chemical properties, *Pentachlorphenol, *Toxicity testing, *Molting,

The LC50 values obtained for the intermolt and early premolt shrimp were similar. Substantially lower LC50 values were noted for late premolt animals at all exposure times. Visual observations animals at all exposure times. Visual observations indicated that for late premolt animals mortalities occurred shortly after they molted. If the animals were able to survive about the first six hours following the molt, they generally survived the test. No deaths were recorded for control animals during the 96 hour tests. (EIS-Deal) W79-00078

IDENTIFICATION OF KEPONE ALTERATION PRODUCTS IN SOIL AND MULLET

Food and Drug Administration, Washington, DC. Div. of Chemistry and Physics. For primary bibliographic entry see Field 5A. W79,00096

THE EFFECT OF NAPHTHALENE ON SUR-VIVAL AND ACTIVITY OF THE AMPHIPOD PARHYALE,

Texas Univ. at Austin, Port Aransas. Port Aransas Marine Lab.

W. Y. Lee, and J. A. C. Nicol.

Bulletin of Environmental Contamination and Toxicology, Vol 20, p 233-240, 1978. 6 fig, 2 tab, 6

*Mortality, *On, demand, Or-Descriptors: *Toxicity, *Mortality, *Oil, *Amphipoda, Biochemical oxygen demand, Organic compounds, Animal physiology, Animal metabolism, Animal behavior, Water pollution effects, Oil pollution, Laboratory tests, *Naphthalenes, *Toxicity testing.

Experiments with a closed system show that naphthalene has a deleterious effect on Parhyale at a concentration beginning at 3 ppm, at which most of the animals recovered. Much higher levels of naphthalene (2 or 3x) were required to kill Par-hyale in open vessels compared with closed containers for a 24h exposure. A persistent damaging effect was found in some of the survivors from both open and closed systems, this effect appeared at much lower concentrations among the survivors from the closed vessels. Under natural conditions these debilitated animals would be vulnerable because they could not move about or

W79-00081

GROWTH AND DIETS OF TROUT FROM CONTRASTING ENVIRONMENTS IN A GEOTHER-MALLY HEATED STREAM: THE FIREHOLE RIVER OF YELLOWSTONE NATIONAL PARK, Montana State Univ., Bozeman. Dept. of Biology. L. R. Kaeding, and C. M. Kaya. Transactions of the American Fisheries Society. Vol 107, No 3, p 432-438, 1978. 3 fig. 1 tab, 28 ref.

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Descriptors: *Fish physiology, *Growth rates, *Brown trout, *Rainbow trout, *Geothermal stu-*Brown trout, *Rainbow trout, *Geothermal stu-dies, Seasonal, Food habits, Fish behavior, Fish food organisms, Fish populations, Caddisfiles, Thermal water, Fish diets, Water temperatures, Aquatic environ

Differences in seasonal patterns of growth, length at age, and diet were evident between brown trout residing in geothermally heated and unheated sec-tions of the Firehole River. Maximum temperatures at the warmest station exceeded 28C and averaged about 10.5C higher than the unheated averaged about 10.5°C higher than the unheated station throughout the year. Scale characteristics indicated that brown trout from the heated stations had two annual growth periods while those from the unheated station had one, relatively short, an-nual growth period. Brown trout from the heated stations were similified to the control of the stations were similified to nual grown period. Brown trout from the neather stations were significantly longer at any particular age than those from the unheated station. Caddis-flies were the numerically dominant food in the unheated water while trout at the heated station fed most extensively on dipterans, molluscs, and mayflies. Additionally, trout in the unheated water fed mainly on immature benthic insects while those at the heated station fed heavily on emerging and exhibited considerably greater bers of organisms per stomach. Rainbow trout nu-merous only at the heated station, had seasonal growth pattern, length at age, and diet similar to those of brown trout at this station. (EIS-Deal)

EFFECTS OF FEEDING AND OF CHEMICAL STIMULATION ON THE OXYGEN UPTAKE OF NASSARIUS RETICULATUS (GASTROPODA: PROSOBRANCHIA),

Dundee Univ. (Scotland). Dept. of Biological Sciences.

M. Crisp, J. Davenport, and S. E. Shumway. Journal of the Marine Biological Association of the United Kingdom, Vol 58, p 387-399, 1978. 8 fig, 12 ref.

Descriptors: *Oxygen, *Respiration, *Gastropods, *Snails, Animal behavior, Food habits, Absorption, Animal physiology, Oxygen requirements, Animal metabolism, Enzymes, Chemicals.

Exposure to food odours causes an increase in oxygen uptake by Nassarius reticulatus. The response is immediate and lasts between 1/4 and response is immediate and insis between 1/4 and 1/2 h. When snails have fed, oxygen uptake remains elevated for 2-3 days. The duration of elevated rates of oxygen uptake parallels the duration of the behavioral effects of feeding. (EIS-Deal) W79-00083

FISH AND WILDLIFE INVENTORY OF THE FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II, American Museum of Natural History, Placid, FL.

American Museum of Natural History, Placid, FL. Archbold Biological Station.

J. N. Layne, J. A. Stallcup, G. E. Woolfenden, M. N. McCauley, and D. J. Worley.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 456, Price codes: A99 in paper copy, A01 in microfiche. Also available as PB-278 457, Price codes: A99 in paper copy, A01 in microfiche. September 1977.

Volume I -

Descriptors
*Phosphate
*Wildlife, *
sus, Indus
Balance of
Population,
Hydrology,
Regional an

The potenti associated i dlife withi Manatee, a nd wildlife known to habitats, an of phospha regional fa to minimize and (4) to ic needs for a dlife inven as well as placed on rare and en terest beca ness as in Also includ the area its hydrologic tions of ph tant sanctu (Majtenyi-) W79-00100

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MEMBRA TIOUS BO FROM WA North Dak S. R. Tschi Applied M Dec. 1974. NDAK(2).

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concentrat from 1-lite nitrate me size) effici water, and brane by el ing sonic was 70 pero W79-00148

B. R. /HAN North Dak nary Science The Amer Volume I - 643 p, 123 fig, 34 tab, Volume II - 635 p, 164 fig, 7 tab. 14-16-0009-77-005.

Descriptors: *Water pollution effects, *Phosphates, *Florida, *Mine wastes, *Fish, *Wildlife, *Ecology, Environmental effects, Census, Industrial wastes, Balance of nature, Vegetation effects, Habitats, Population, Ecosystems, Climate, Geology, Hydrology, Land use, Soil types, Data collections, Regional analysis.

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Regional analysis.

The potential impact of phosphate mining and its associated industrial processes on the fish and wildlife within seven central Florida counties, (Charlotte, DeSoto, Hardee, Hillsborough, Poik, Manatee, and Sarasota) is examined. Principal objectives were: (1) to compile available data on fish and wildlife, including an accurate list of species known to occur in the region, their distribution, habitats, and population levels; (2) to use this data to assess the potential direct and indirect impacts of phosphate mining on individual species and on regional fauna as a whole; (3) to recommend methods of mining or reclamation, mining regulations, and other asspects of the phosphate industry to minimize adverse effects on fish and wildlife; and (4) to identify significant information gaps and needs for additional studies. The scope of the wildlife inventory includes all vertebrate groups, fishes, amphibians, reptiles, birds, and mammals, as well as selected invertebrates. Emphasis is placed on priority species, such as those on the rare and endangered species lists, those of commercial or sport value, and those of particular interest because of scientific importance or usefulness as indicators of environmental conditions. Also included is a survey of the physical nature of ness as indicators of environmental conditions. Also included is a survey of the physical nature of the area itself, such as climate, geology, soil types, hydrologic units, vegetation distribution, and locanydrougic units, vegetation distribution, and toca-tions of phosphate company holdings and impor-tant sanctuaries, wildlife refuges, and preserves. (Majtenyi-IPA) W79-00100

A METHOD OF MEASURING BACTERIAL GROWTH IN AQUATIC ENVIRONMENTS USING DIALYSIS CULTURE, Texas Tech Univ., Lubbock. Dept. of Microbiolo-

For primary bibliographic entry see Field 5A. W79-00109

MEMBRANE CONCENTRATION OF INFECTIOUS BOVINE RHINOTRACHEITIS VIRUS FROM WATER, North Dakota State Univ., Fargo.
S. R. Tschider, D. L. Berryhill, and I. A. Schipper. Applied Microbiology, Vol. 28, No. 6, p 1030-1032, Dec. 1974, I fig., I tab, II ref. OWRT-B-022-NDAK(2), 14-31-0001-3923.

Descriptors: *Viruses, Methodology, *Membrane processes, *Membrane adsorption procedure, *Infectious bovine rhinotracheitis virus, Cellulose aitrate membrane filters, Herpesvirus, Elution, Fetal calf serum, Sonic treatment.

A membrane adsorption procedure was used to concentrate infectious bovine rhinotracheitis virus from 1-liter quantities of distilled water. Cellulose nitrate membrane filters (0.45-microgram pore size) efficiently adsorbed this herpesvirus from water, and virus was recovered from the membrane by elution with 10 ml of fetal calf serum during sonic treatment. The average recovery rate was 70 percent.

W79-00148

B. R. /HANSON ; I. A. /SCHIPPER North Dakota State Univ., Fargo. Dept. of Veteri-

nary Science.
The American Journal of Veterinary Research, 70l. 37, No. 6, p. 707-708, June 1976, 2 fig., 1 tab, 11 ref. OWRT-B-022-NDAK(3), 14-31-0001-3923.

Descriptors: *Viruses, Methodology, recovery rates, "Infectious bovinre rhinotracheitis, *Swab materials, Polyester, Calcium, Alginate wool.

The recovery rates of infectious bovine rhinotracheits virus from swab materials were compared. The adsorptive and elutive properties compared. The adsorptive and elutive properties of cotton, polyester, and calcium alginate wool were examined by direct exposure of infectious bovine rhinotracheitis virus to swab materials in buffered tissue culture medium. Calcium alginate wool was virucidal; this was apparent after 2 hours' exposure. Cotton and polyester swab materials exhibited little virucidal effects. The addition of wooden applicator sticks with the swab materials reduced viral titers further.

W79-00150

THE ENVIRONMENTAL EFFECTS CHROMIUM IN TANNERY EFFLUENTS, Barrie Tanning Ltd. (Ontario).

S.A. J. Shivas.

Journal of the American Leather Chemists Association, Vol. 73, No. 8, p 370-377, August, 1978.

1 tab, 14 ref.

Descriptors: "Chromium, "Tannery wastes, "Solubility, "Toxicity, "Chemical properties, Chemical precipitation, Ion exchange, Biological treatment, Activated sludge, Soils, Leaching, Permeability, Membrane processes, Movement, Waste water treatment, Industrial wastes.

The physico-chemical properties of trivalent chromium, present in tannery effluents, were examined with respect to treatment, disposal, and ultimate environmental effects. The potential was very low for reverse oxidation of trivalent chrominate to the highly respect to the property of very low for reverse oxidation of trivalent chromium by the highly toxic hexavalent chromium by aerial oxidation or pH increases above 4. Cr(III) was precipitated at pH 5-12; the chromite ion formed above pH 12 required manganese ions as a catalyst for oxidation. Cr(III) usually forms in soluble complexes, reducing its potential for leaching into subsoils or groundwater from landapplied sludges. The limited mobility of the triply-charged catino and its aegreeation with proteins applied sludges. The limited mobility of the triply-charged cation and its aggregation with proteins and other colloids imparted poor membrane permeability to chromium. Complexed Cr(III) in tannery effluent will precipitate with primary sludge and will adsorb on biological flocs in the activated sludge process. The presence of high levels of Cr(III) during biological treatment has been found to reduce the degree of nitrogen breakdown, hinder microbial degradation, and inhibit oxygen absorption by sludge microorganisms. While Cr(III) levels of 300 mg/liter in digesters have been tolerated at retention times longer than 20 days, levels in the feed to a municipal treatment plant were not expected to exceed 10 mg/liter; Cr(III) was found to artificially suppress BOD values. was found to artificially suppress BOD values. When applied to soils, Cr(III) exhibited an initial toxic effect on microorganisms; chromium was readily immobilized when applied to soils having a moderate to high ion exchange capacity. (Lisk-FIRL) W79-00156

WATER HARDNESS AND CARDIOVASCULAR

WATER HARDNESS AND CARDIOVASCULAR MORTALITY,
Ottawa Univ. (Ontario). Dept. of Epidemiology and Community Medicine.
L. C. Neri, and H. L. Johansen.
Annuals of the New York Academy of Sciences,
Vol. 304, p. 203-219, March 30, 1978. 5 fig. 11 tab. 94 ref.

Descriptors: "Hardness, "Water quality, "Hypertension, "Cardiovascular mortality, Soft water, Magnesium, Cadmium, Canada.

There is a lack of agreement among researchers as to the geographic relationship between water quality and cardiovascular mortality. The presence of lead, cadmium, sodium, nitrates, and the lack of

calcium and magnesium in soft water areas are thought to be associated with hypertension and increasing mortality but no definite conclusions have been reached. Several criteria are proposed for judging whether an element is associated with hypertension. They are: Its concentration in water supplies must follow the geographic distribution of water hardness; Its postulated effect has to be consistent with the geographic variation in cardiovascular mortality; Its concentration in drinking water, compared to other sources, must be suit ficient to exert the postulated effect. In a recent autopsy study of elements in the myocardium of residents of hard and soft water areas, magnesium was the only one which indicated a pattern by being: More abundant in hard than in soft water areas, More abundant in the myocardium of areas, More abundant in the myocardium of healthy subjects than of those with heart disease, More abundant in the myocardium of hard water residents than of soft water residents. Lastly, its residents than of soft water residents. Lastly, its concentration in water shows the strongest negative correlation with mortality due to all causes. (Purdin-NWWA) W79-00171

THE PHOTOSYNTHETIC AND RESPIRATORY RATES AND TOLERANCES OF BENTHIC ALGAE FROM A MANGROVE AND SALT MARSH ESTUARY: A COMPARATIVE STUDY, University of South Florida, Tampa. Dept. of Biology. C. J. Dawes, R. E. Moon, and M. A. Davis.

Estuarine and Coastal Marine Science, Vol. 6, No. 2, p 175-185, February 1978. 5 fig. 2 tab. 30 ref.

Descriptors: *Salt marshes, *Mangrove swamps, *Photosynthesis, *Respiration, *Algae, Benthic flora, Seaweeds, Florida, Weeki Wachee River(FL), Cockroach Bay(FL), Estuaries, Salinity, Dessication, Light chlorophyll, Temperature, Intertidal areas, Subtidal areas, Bostrychia binderi, Gracilaria verrucosa, Cladophora repens, Acanthophora spicifera, Catenella repens, Spyridia filamentos, Rhodophyta.

Comparative examination of net photosynthetic and respiratory rates of dominant red and green algae from a salt marsh and from a mangrove community on Florida's west coast showed higher chlorophyll levels among salt marsh algae. Two subtidal and two intertidal species were selected from each site. Optimal temperatures, light inten-sities, and salinities for the species were compared and effects of dessication on the intertidal species and effects of dessication on the intertudal species were studied. Net photosynthetic and respiratory rates were similar for both intertidal species from each site, and they showed broad tolerances to salinity with positive photosynthetic responses even when held in distilled water for three days. even when held in distilled water for three days. All intertidal species, monitored in the air as well as submerged, had high photosynthetic rates after dessication periods of four, eight, or sixteen hrs/day for three days. Peak photosynthetic rates for all species occurred at 11,200 microW/sq cm white light at 30-36C and 20-30% salinity. Subtidal algae in the mangrove community had photosynthetic rates 5-10 times higher than in the photosynthetic rates 3-10 times higher than in the salt marsh. In the salt marsh, located at the mouth of the Weeki Wachee River, intertidal species stu-died were Bostrychia binderi and Catenella repens, and subtidal species were Gracilaria verru-cosa and Spyridia filamentosa. In the mangrove cosa and appyridia fulamentosa. In the mangrove community at Cockroach Bay intertidal species were Bostrychia binderi and Cladophora repens, and subtidal species were Gracilaria verrucosa and Acanthophora spicifera. (Lynch-Wisconsin) W79-00204

AN INVESTIGATION OF PRIMARY PRODUC-TION AND ECOSYSTEM METABOLISM IN A LAKE MICHIGAN DUNE POND, Michigan State Univ., East Lansing. Dept. of Rotany.

Botany.

J. W. Barko, P. G. Murphy, and R. G. Wetzel.

Archiv Fur Hydrobiologie, Vol. 81, No. 2, p 155187, November 1977. 7 fig, 6 tab, 77 ref. ERDA

E(11-1)-1599, (COO-1599-94) (ORD-13999, 4282).

Group 5C-Effects Of Pollution

Descriptors: *Primary productivity, *Ponds, *Dunes, *Metabolism, *Algae, *Macrophytes, "Dunes, "Metabolism, "Algae, Macrophytes, "Phytoplankton, "Epipelic algae, Ecosystems, Lake Michigan, Carbon radioisotopes, Respira-tion, Carbon dioxide, Juncus baltucus, Photosynthesis, Seasonal, Distribution, Biological communities, Aquatic plants, Trophic level,

Net primary productivity of phytoplankton, epipelic algae, and macrophytes in a small (0.25 ha) pond in the sand dunes along Lake Michigan near the Kalamazoo River delta, Michigan, were estimated on an annual basis, along with estimates of gross assimilation and ecosystem respiration. Total net primary productivity (TNPP) was 348 mg C/sq m/day. Macrophytes accounted for 61% of TNPP, followed by epipelic algae at 26% and phytoplankton at 13%. Gross assimilation (347 mg C/sq m/day) exceeded ecosystem respiration (377 mg C/sq m/day). The P/R ratio, estimated at 1.45, indicated potential accrual of organic carbon at 169 mg C/sq m/day, net ecosystem production.

Annual assimilatuion efficiency was estimated at 0.42%, and growth efficiency at 64%. In situ carbon-14 fixation determined net phytoplankton and epipelic algae primary productivity, and harvest techniques were used for macrophyte productivity. Gross assimilation and ecosystem response cstimates were based on carbon dioxide flux mea-surements made in portable light and dark metabolism chambers enclosing portions of the pond. Laboratory measurements of photosynthesis using the dominant macrophyte, Juneus balticus, were used to interpret seasonal photosynthesis patterns observed in the field. The pond was autotrophic (P/R 1.0) during summer and heterotrophic (P/R 1.0) in winter. Seasonal distribution and productivity of the algae are discussed. (Lynch-Wisconsin) W79-00205

WATERHYACINTH (EICHHORNIA CRAS-SIPES) NUTRIENT UPTAKE AND METABOL-ISM IN A NORTH CENTRAL FLORIDA MARSH.

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences. W. J. Mitsch.

Archiv fur Hydrobiologie, Vol 81, No 2, p 188-210, November 1977. 10 fig, 4 tab, 34 ref. NSF GK-

*Marshes, *Water hyacinth,
*Lake Alice(FL), *Nutrients, Descriptors: Metabolism. *Water pollution effects, *Nutrient removal, *Path of pollutants, Eichhornia crassipes, Florida, Lakes, Sewage disposal, Tertiary treatment, Cooling water, Heated water, Sediments, Absorption, Phosphorus, Nitrogen, Water temperature, Prima-ry productivity, Beneficial use, Denitrification.

Effects of high nutrient loading from secondary sewage effluent on the marshy eastern part of Lake Alice, Gainesville, Florida were studied, with special attention to the disposition of nitrogen and phosphorus, and to the metabolism of water hyacinth (Eichhornia crassipes) which dominates the marsh. Construction of an earthen dam in 1948 and addition of the sewage effluent and heated once-through condenser water from a heating plant in 1964 increased the lake's size from four to thirty-three ha. High nutrient levels and water temperatures in the 29-31 range have resulted in gross primary productivity among the highest ever re-ported-19.3 g C/sq m/day for large hyacinths and 15.6 g C/sq m/day for dwarf hyacinths. Net production efficiencies were about 1.6% of solar insolation for both plants. Uptake of total nitrogen averaged 49% across the marsh. Nitrate showed a seasonal pattern of greater uptake from winter to summer; phosphorus uptake averaged 11% with signs of a net phosphorus export in winter. Rapid nutrient turnover and high water hyacinth metabolism apprarently accounts for the low percentage of nitrogen and phosphorus uptake. Seasonal changes in nitrate levels leaving the

marsh suggest denitrification is a significant nitrogen sink, and sediments continue to act as an additional nitrogen source to overlying waters.
Use of a hyacinth marsh as a natural tertiary treatment system would require much lower nutrient loading rates to be effective. (Lynch-Wisconsin) W79-00206

PHOTOSYNTHESIS AND CARBON METABOLISM IN MARINE AND FRESHWATER ISM IN DIATOMS.

DIATUMS, Cologne Univ. (Germany, F.R.) Botanisches Inst. B. P. Kremer, and R. Berks. Zeitschrift fur Pflanzenphysiologie, Vol 87, No 2, April 1978, p 149-165. 12 fig, 2 tab, 26 ref.

Descriptors: *Diatoms, *Photosynthesis, *Carbon radioisotopes, *Metabolism, *Darkness, Algae, Carbon dioxide, Amino acids, Carbon fixation, Assimilation, Kinetics.

Several diatom species taken from marine, brackish, and freshwater habitats were used in brackish, and freshwater habitats were used in laboratory experiments to characterize photosynthesis, photosynthetic carbon assimilation, and carbon fixation in the dark. Dark fixation generally did not exceed 4-5% of photosynthetic carbon-14 incorporation. The assimilate pattern of long-term photosynthesis in HI4CO3 comprised a complex variety of soluble and insoluble assimilates. lates; considerable amounts of carbon-14 were recovered from several amino acids, particularly glutamate. Relatively little carbon-14 was confined to low molecular weight carbohydrates, such as glucose and fructose. Sucrose or polyhydroxy alcohols (mannitol) were not found to be carbon-14 labelled photosynthates. Appreciable amounts were converted to polymeric constituents, mainly polysaccharides and various lipids, accounting for over 60% of total radioacarbon found in soluble assimilates after long periods of photosynthetic carbon-14-fixation. Short-term photosynthetic car-bon-14 incorporation experiments resulted in predominant carbon-14 labelling of phosphory-lated compounds (such as 3-phosphoglycerate) and some sugar phosphates, showing the typical time-dependent decrease in percentage of carbon-14 labelling; C4 compounds (including asparate and malate) exhibited very different carbon-14 labelling kinetics. Results suggest that photosynthetic carbon fixation in diatoms does not resemble the C4 pathway but generally follows the Calvin scheme. (Lynch-Wisconsin) W79-00208

AND ENVIRONMENTS DIVERSITY BENTHIC INVERTEBRATE COMMUNITIES IN

SOUTH SWEDISH STREAMS, Lund Univ. (Sweden). Dept. of Animal Ecology. F. Friberg, L. M. Nilsson, C. Otto, P. Sjostrom, and B. W. Svensson.

Archiv fur Hydrobiologie, Vol 81, No 2, November 1977, p 129-154. 2 fig, 6 tab, 37 ref, 2

Descriptors: Streams, *Lotic environment, *Skane(Sweden), *Invertebrates, *Benthic fauna, *Species diversity, *Sweden, Faunal lists, Data collections, Habitats, Species composition, Distribution, Insects, Seasonal, Ephemeroptera, Plecoptera, Coleoptera, Trichoptera, Ecology, Abundance, Larvae, Verkaan Stream(Sweden), Forsakarsbacken Stream(Sweden), Braan Stream(Sweden), Agricultural runoff.

Three streams in the province of Skane in southern Sweden were sampled for benthic invertebrates in May and October 1974 to study relationships between lotic communities and their entrionments. Streams sampled were the Verkan, Forsakarsbacken, and Braan, all of which run through farmland, pastures, and deciduous woodland, and which were selected on the basis of moderately fast current, little silt deposition, sparse macrophyte vegetation, and stony or sandy bottom. Overall, environmental diversification

within a given stream was so high that benthic communities were almost as different between sites in a stream as between sites in different streams. Some streams were markedly affected by agricultural pollution and other disturbances. A agricultural pollution and other disturbances. A species list is provided in appendices. The general pattern of species abundance distribution is about log-normal. Different samples from the same locality were more similar to each other than to sam-ples from elsewhere in the same stream or in other streams. Species diversity in one season was un-correlated with that in another, and the major taxa-Ephemeroptera, Plecoptera, Coleoptera, and Trichoptera--varied independently with respect to their local diversity. Few correlations respect to their local diversity. Few correlations were found between environmental variables and community parameters. Colonization assemblages correlated positively with richness of the surrounding natural community if sufficient number of taxa were included. (Lynch-Wisconsin) W79-00209

DIEL CYCLES OF INORGANIC NITROGEN UPTAKE IN A NATURAL PHYTOPLANKTON POPULATION DOMINATED BY GONYAULAX

POPULATION DUMINATED POLYEDRA,
Bigelow Lab. for Ocean Sciences, West Boothbay
Harbor, ME.
J. J. MacIsaac.

Limnology and Oceanography, Vol 23, No 1, January 1978, p 1-9. 6 fig, 1 tab, 28 ref.

*Gonyaulax *Diel *Phytoplankton, *Diel cycles, *Nitrates, *Ammonium, *Red tide, *Diel migration, Algae, Dinoflagellates, Oceans, Baja California(Mexico), Mexico, Biorhythms, Absorption, Nitrogen, Inoganic compounds, Light, Diatoms, Nutrients, Limiting factors.

Diel uptake rates of N15-labelled nitrate and am-Diet uptake rates of N13-tabetted intrate and am-monium by phytoplankton dominated by Gonyau-lax polyedra were measured directly in natural populations during a bloom of the dinoflagellate off Punta San Hipolito, Baja California, Mexico in off Punta San Hipolito, Baja California, Mexico in March 1972. To generate uptake rates sufficiently high for these populations to reach bloom proportions, the simultaneous presence of light and inorganic nitrogen (especially nitrate) appeared necesary. Data revealed no significant differences in light requirements between diatoms and dinoflagellates. The apparent paradox of dense populations of dinoflagellates (red tides) occurring in nutrient-depleted surface waters has been observed for many years; possibly, downward migration allows them to take up significant amounts of nutrients in the enriched bottom of the photic zone in the dark. However, field results presented her do not support the hypothesis that dinoflagellates do not support the hypothesis that dinoflagellates have any special capacity for dark nutrient uptake, nor are special cellular characteristics beyond migration necessary to explain occassions of dinoflagellate dominance. Nevertheless, the dark uptake of nitrate, apparently equally characteristic of starved dinoflagellates and diatoms, plus the migratory capability of dinoflagellates may help to explain the persistence of dinoflagellate blooms after their development. (Lynch-Wisconsin) W79-00210

EFFECTS OF N:P ATOMIC RATIOS AND NITRATE LIMITATION ON ALGAL GROWTH, CELL COMPOSITION, AND NITRATE UP-TAKE, New York State Dept. of Health, Albany. En-

vironmental Health Center. G. Y. Rhee.

Limnology and Oceanography, Vol 23, No 1, January 1978. p 10-25. 12 fig, 2 tab, 73 ref.

Descriptors: *Nitrogen, *Phosphorus, *Limiting factors, *Phytoplankton, *Nitrates, *Plant growth, *Eutrophication, Algae, Nutrients, Scenedesmus, Proteins, Absorption, Carbon, Chlorophyll, Baseline studies, Lakes, Estuaries Cytological studies, Chemostats.

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Phytoplankton growth during the transition between the nitrogen- and phosphorus-limited states common in lakes and coastal seawaters was investigated in laboratory experiments using Scenedesmus sp. Emphasis was on changes in celinvestigated in laboratory experiments using Scenedesmus sp. Emphasis was on changes in cellular composition because the growth rate (mu) of phytoplankton as limited by various nutrients is a direct function of the cellular level of the nutrients. Kinetics of nitrogen-limited growth and nitrogen uptake were also investigated to provide baseline information to be used with previous findings on phosphorus-limited growth and uptake. Scenedesmus sp. was grown in chemostats as a fixed growth rate in an inorganic medium, with nitrogen-to-phosphorus atomic ratios (N:P) ranging from 5-80. No additive of multiplicative effect of the double nutrient limitation was found; below the optimal cell N:P of 30, growth was determined solely by nitrogen limitation, while above 30 growth was dependent on phosphorus limitation. Cell nitrogen remained constant up to the optimal ratio and above it increased linearly with N:P. The level of cell phosphorus was high at low N:P, but decreased rapidly until N:P remained constant at a low level. Protein was the major fraction in which excess nitrogen accumulated under phosphorus limitation. Cell free amino acids were a constant proportion of cell nitrogen at all N:P ratios. RNA concentration was the same regardless of N:P. proportion of cell nitrogen at all N:P ratios. RNA concentration was the same regardless of N:P, with its level determined by mu. Cell carbon was higher in the phosphorus-limited states. (Lynch-3, No 1,

> SEASONAL CHANGES IN RESPIRATORY ENZYME ACTIVITY AND PRODUCTIVITY IN LAKE WASHINGTON MICROPLANKTON, Washington Univ., Seattle. Fisheries Research

A. H. Devol, and T. T. Packard. Limnology and Oceanography, Vol 23, No 1, January 1978, p 104-111. 3 fig, 1 tab, 46 ref.

Descriptors: *Seasonal, *Respiration, *Enzymes, *Lake Washington(WA), *Eutrophication, *Phytoplankton, Photosynthesis-respiration ratio, Washington, Primary productivity, Lakes, Carbon radioisotopes, Euphotic zone, Microplankton, Dark respiration, Photosynthesis, Electron transport system, Nutrients, Phosphates, Stratification.

Calculations of cyclical seasonal respiration from Calculations of electron transport system (ETS) activity in natural phytoplankton assemblages are presented for Lake Washington (WA) for January-December 1974. During the first few for January-December 1974. During the first few months of the year minimum ETS activity (4.2 mg o sub eq/sq m/hr), carbon-14 uptake (84 mg C/sq m/day), and chlorophyll (10.1 mg/sq m), coincided with minimum temperature (about 6.2C) and maximum nutrient concentrations (phosphate, 250 mg/sq m; nitrate, 3.5 g/sq m). Maximum ETS activity (109.8 mg 0 sub eq/sq m/hr), carbon-14 uptake (2126 mg C/sq m/day), and chlorophyll (121.7 mg/sq m) occurred during spring bloom. During the fall period of thermal stratification and nutrient depletion, values were intermediate. Respiration rates were used to calculate production:respiration ratios (P:R), which were low in the summer and fall and high in winter. The percentage of primary production oxidized during a 12-hr dark period varied from 7-100%, with high percentages in summer, low in late winter. Dark percentages in summer, low in late winter. Dark respiration should be considered in any study of the fate of photosynthetically fixed carbon; 10-40% of carbon-14 carbon incorporated by marine algae can be lost in a four-hr dark period. The P:R agate can be lost in a four-in dark period. The F:k rate has been considered the major single measure of the physiological state of phytoplankton popu-lations. (Lynch-Wisconsin) W79-00212

PHYTOPLANKTON EXTRACELLULAR RELEASE AND ITS RELATION TO THE

SEASONAL CYCLE OF DISSOLVED ORGANIC CARBON IN A EUTROPHIC LAKE, State Univ. of New York at Fredonia. Environ-mental Resources Center. T. A. Storch, and G. W. Saunders. Limnology and Oceanography, Vol 23, No 1, January 1978, p 112-119. 4 fig, 1 tab, 24 ref.

Descriptors: "Eutrophication, "Seasonal, "Dissolved organic carbon, "Frains Lakes(MI), "Phytoplankton, "Organic matter, "Degradation(Decomposition), Carbon, Michigan, Lakes, Organic compounds, Bacteria, Littoral, Macrophytes, Algae, Photosynthesis.

Phytoplankton extracellular release was not a significant source of dissolved organic carbon (DOC) in eutrophic Frains Lake, near Ann Arbor, Michigan during major fluctuations of total dissolved organic caron (TDOC). Increases in TDOC concentration greatly exceeded amounts accumulated from release by phytoplankton, even when maximum rates of phytoplankton DOC release were calculated by assuming release exclusively from a large intracellular pool not at isotopic equilibrium. Data suggest that 42-98% of total dissolved organic matter input to the pelagial surface equilibrium. Data suggest that 42-98% of total dis-solved organic matter input to the pelagial surface waters is derived from other sources; the most im-portant are probably: (1) decomposition of dead phytoplankton, (2) release by littoral primary producers, and (3) decomposition of particulate organic matter in surficial sediments. DOC released from decomposition of algal detritus is released from decomposition of algal detritus is estimated to be two to six times that secreted by living phytoplankton in Frains Lake. Release of DOC by littoral macrophytes and associated flora exceeded release from living phytoplankton by more than double in a marl lake. In this study, conducted April-October 1970, TDOC concentrations fluctuated aperiodically. Phytoplankton DOC release and daily bacterial assimilation rates of phytoplankton extracellular DOC also fluctuated markedly. Bacterial utilization of phytoplankton DOC alone could not account for TDOC decreases. (Lynch-Wisconsin) W79-00213

GROWTH, MORTALITY, AND BIOMASS PAR-TITIONING IN FRESHWATER TIDAL WET-LAND POPULATIONS OF WILD RICE (ZIZANIA AQUATICA), Rider Coll., Trenton, NJ. Dept. of Biology.

D. Whigham, and R. Simpson.
Bulletin of the Torrey Botanical Club, Vol 104, No
4, p 347-351. 2 fig, 1 tab, 21 ref.

Descriptors: *Zizania aquatica var. aquatica, *Wild rice, *Primary productivity. *Biomass, *Plant growth, *Hamilton Marshes(NJ), New Jersey, Marshes, Tidal marshes, Mortality, Delaware River, Wetlands, Marsh plants, Root development, Seeds.

An investigation of wild rice in the Hamilton Marshes on the New Jersey side of the Delaware River April-September 1974 showed very high River April-September 1974 showed very high production rates and high seed production. Net primary production, which varied seasonally, reached July maximum of 20.9 g/sq m/day (0.4x) g/plant, following seedling establishment; lowest production rates occurred during the seedling phenophase in May (0.07 g/plant, or 10.2 g/sq m). Productivity declined in late July with the onset of flowering and fruiting, with values of 0.1 g/plant (10.8 g/sq m) in August and September. The highest rate coincided with the period of rapid growth in height, and the decline with the reproductive phenophases, thus wasting minimum growth in height, and the decline with the reproductive phenophases, thus wasting minimum energy in shoot and root growth. Potential seed production is estimated at 37,300/sq m. About 65% of biomass was allocated to root production during the seedling phenophase. Population mortality was constant between May and early August. Eight populations of wild rice were sampled during the study in the marshes, the northernmost freshwater. study in the marshes, the northernmost freshwater tidal wetlands in the Delaware River drainage basin. Seedling densities were determined on May

15, about two weeks after germination; densities were 188 + or - 69 plants/sq m at that time, and biomass averaged 15 g/sq m. (Lynch-Wisconsin) W79-0021

MORPHOMETRIC CHANGES IN ASTERIONELLA FORMOSA COLONIES UNDER PHOSPHATE AND SILICATE LIMITA-

TION, Michigan Univ., Ann Arbor. Div. of Biological

D. Tilman, S. S. Kilham, and P. Kilham. Limnology and Oceanography, Vol 21, No 6, 1976, p 883-886, 1 fig, 17 ref. NSF GB-41315.

Descriptors: *Asterionella formosa, *Phosphates, *Silicates, *Limiting factors, *Analytical techniques, *Plant morphology, Morphometry, Methodology, Diatoms, Phytoplankton, Algae, Mesotrophy, Bioindicators, Equilibrium, Colonies, Size, Plant growth, Lakes, Nutrients.

Experiments demonstrated that colony size can be used to assess whether a natural population of the planktonic diatom Asterionella formosa is silicate planktonic diatom Asterionella formosa is silicate or phosphate limited. At high steady-state growth rates, the cells per colony averaged eight. Under phosphate limitation, the number of cells per colony decreased linearly with decreasing steady-state growth rate to less than two cells per colony at very low growth rates. Under silicate limitation, the number of cells per colony increased exponentially with decreasing tready crowth sate is consequently. tale number of cells per colony increased exponen-tially with decreasing steady growth rate in to over 20 cells per colony at very low growth rates. In na-ture, increases in colony size above eight cells/colony would indicate silicate limitation, and decreases below 6-8 cells/colony would indicate phosphate limitation. A. formosa is a major phytoplankter in mid-latitude mesotrophic lakes phytoplankter in mid-latitude mesotrophic lakes and impoundments. An axenic clone of A. formosa isolated from Frains Lake, Michigan, was used in the tests. Cultures were grown at 20C on a 14-10 hr light-dark cycle with illumination of about 100 microein/sq m/sec in medium WC, modified so that either phosphate or silicate would be the limiting nutrient. The population was allowed to grow to steady state in flow-through, semicontinuous cultures. At rates near the maximum rate of cultures. At rates near the maximum rate of growth, Asterionella was barely limited by any growth, Asterionella was barely limited by any nutrient. Because it is unlikely that steady-state conditions prevail in lakes, colony morphology should not be used to estimate the absolute rate of growth of natural (Lynch-Wisconsin)

W79-00215

BENTHIC ALGAE IN A POND AFTER THE AC-CUMULATION OF BEET-SUGAR FACTORY

Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.

K. Kyselowa. Acta Hydrobiologica, Vol 19, No 3, p 215-231, 1977. 1 fig, 1 tab, 20 ref.

Descriptors: "Sugar industry, "Water pollution effects, "Benthic flora, "Algae, "Zimowy Wielki Pond(Poland), "Ponds, Sugar beets, "Poland, Industrial wastes, Sediments, Phytoplankton, Species composition, Primary productivity, Chlorophyll, Floral lists, Waste disposal, Photosynthesis, Diatoms, Bottom sediments.

Species composition and primary production of benthic algae were determined for Zimowy Wielki, Poland, a pond which received wastes from a beet sugar factory at nearby Chybie during 1967-72. The study was carried out in 1974, more than a year after waste disposal had stopped. The attached algal community was accompanied by typical pond planktonic algae. The algae were characterized by benthic or epiphytic species of diatoms. Chlorophytes and cyanophytes were also present. Tables list taxa found at the inflow, outflow and center of the pond on seven sampling dates (April-September). Bottom sediment was sampled with a

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tube. Specimens are discussed systematically by taxon. Conditions for survival of the epipelic algae, whose habitat is the upper mud layer, appear to be light and mobility. Greatest chlorophylla concentration was consistently found at the inflow (527-9 micrograms/g dry wt) or in the middle of the pond (209 micrograms/g dry wt), whereas at the outflow in the deepest part, about two m deep, chlorophyll-a content was lower (11.32-92.0 micrograms/g dry wt). Abundant benthic algae occurred until the beginning of July, sometimes several times greater than in control ponds or even fertilized ones, possibly indicating continuing effects of the sugar beet wastes and a stimulating influence of biogeneous substances in the sediments. (Lynch-Wisconsin)

PHYTOPHILOUS FAUNA IN PONDS FERTIL-IZED WITH SUGAR FACTORY WASTES, Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.

K. Srokosz. Acta Hydrobiologica, Vol 19, No 3, p 233-242, 1977. 2 fig, 1 tab, 30 ref.

Descriptors: *Sugar industry, *Invertebrates, *Phytophilous fauna, *Species composition, *Dominant organisms, *Eutrophication, *Ponds, *Industrial wastes, Trophic level, *Poland, Sugar beets, Water pollution effects, Zimowy Wielki Pond(Poland), Lakowy Pond(Poland), Gorol Pond(Poland), Zooplankton, Benthic flora, Algae, Benthic fauna, Chironomidae, Ephemeroptera, Glyceria aquatica, Myriophyllum spicatum, Elodea canadensis, Succession.

Settlement of aquatic plants by phytophilous fauna was studied in two Polish ponds which have received wastes from the Chybie beet sugar factory and one control pond. The objective was to determine dominant fauna and assess the relative influence of trophic conditions and of the host plant in controlling settlement. The accumulation pond Zimowy Wielki, the assimilation pond Lakowy, and the control pond Gorol were sampled biweekly April-September 1971; samples were collected from Glyceria aquatica, common to all three ponds, Myriophyllum spicatum in Zimowy Wielki, and Elodea canadensis in Zimowy Wielki, and Elodea canadensis in Lakowy. Dominant organisms in all ponds and on all plants investigated were larvae of Chironomidae until midsummer and Ephemerop tera (Cloeon gr. dipterum) from midsummer to autumn. About 120 taxa were identified, with the greatest differentiation of taxonomic groups and species in the control pond and the smallest in the accumulation pond Zimowy. In the most enriched pond (Zimowy Wielki) no qualitative or quantita-tive differences were noted in fauna settling G. aquatica or M. spicatum, and typical subdominant bottom fauna were observed. In less-enriched Lakowy the influence of plants on fauna settling them was evident; Elodea attracted Ablabesmyia gr. monilis and Nymphula nymphaeta, while Glyceria aquatica attracted Glyptotendipes gr. gripekoveni. Pond trophic condition determined dominance of Cricotopus gr. silvestris (more eutrophic), Corynoneura (medium enrichment), and Psectrocladium gr. dilatatus (low enrichment). (Lynch-Wisconsin) W79-00217

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOURSM. 1. CHEMISM OF THE RYBI POTOK WATERS AND THE CHLOROPHYLL CONTENT IN ATTACHED ALGAE AND SESTON IN RELATION TO THE POLLUTION,

Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.

Acta Hydrobiologica, Vol 19, No 3, p 243-255, 1977.4 fig. 2 tab. 27 ref.

Descriptors: "Rybi Potok(Poland), "Water pollution effects, "Sewage disposal, "Water chemistry, "Chlorophyll, Streams, Eutrophication, "Poland, Tourism, Biocenoses, Mountains, Tatra Mountains, Seston, Algae, Benthic flora, Lake Morskie (Oko(Poland), Phosphorus, Limiting factors, Electrolytes, Conductivity, Self-purification.

In the Rybi Potok, a mountain stream in Poland's Tatra National Park sewage pollution from a heavily used tourist shelter was especially reflected in phosphate and ammonia levels, and electrolyte concentrations were extremely low. Sampling was conducted February 1971-June 1972 in a four-km section of the stream. Chlorophyllacontent of attached algae and seston was determined. Phosphates and ammonia were found to limit primary production over the entire section of the stream investigated. The stream, flowing on a granite substratum, showed little seasonal variation in the extremely low concentrations of electrolytes and conductivity. Increase in organic matter due to the sewage was only slightly evident in higher BOD5 and free carbon dioxide chiefly below the sewage inflow, where chloride and sodium concentrations also rose. The nitrate to ammonia ratio suggests very rapid mineralization and nitrification. Increased fertility in the stream resulted in increased chlorophyll content in attached algae on an areal basis. At low water levels self-purification of the Rybi Potok was completed before the stream flowed into small downstream ponds, and at high water levels it was completed shortly below the inflow. (See also W79-00219) (Lynch-Wisconsin)

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOUR-ISM. 2. BACTERIA AS AN INDEX OF WATER POLLUTION ON THE RYBI POTOK STREAM, Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.

A. Starzecka. Acta Hydrobiologica, Vol 19, No 3, p 257-270, 1977. 3 fig, 3 tab, 23 ref.

Descriptors: *Rybi Potok(Poland), *Water quality indices, *Bioindicators, *Bacteria, *Water pollution effects, *Self-purification, *Eutrophication, *Poland, Lake Morskie Oko(Poland), Tatra Mountains, Mountains, Streams, Sewage disposal, Tourism, Heterotrophic bacteria, E coli, Biocenoses, Denitrification, Annual.

Quantitative changes of several physiological groups of heterotrophic bacteria were compared over the annual cycle in polluted and unpolluted sectors of the Rybi Potok, a mountain stream in Poland's Tatra National Park, to develop a pollution index. Heterotrophic bacteria included were proteolytic ammonifying and denitrifying bacteria and Escherichia coli. Based on numerical changes in bacteria a logarithmic comparative coefficient (LCC) was calculated which permitted differentiation of two zones of self-purification in a 3.2-km section of the stream. Rybi Potok stream is contaminated by sewage inflow from a tourist shelter used by over a million persons/yr upstream at Lake Morskie Oko. Six stations were sampled May 1971-June 1972 at 1.5-mo intervals. It is concluded that sewage disturbs the natural biocenosis of the Rybi Potok, but owing to bacterial biochemical action with favorable oxygen conditions (6.7-12.3 mg 02/liter), self-purification processes counteract noxious effects of the sewage in a short section of the stream. Water quality at Station 1, at the source of Rybi Potok at Lake Morskie Oko, can be regarded as pure, while at Station 2 (the sewage inflow) the water contains great numbers of bacteria and may be classified strongly polluted. At Station 1 the influence of natural factors is manifested in one annual peak in bacterial numbers, while at Station 2 two periods of maximum increases suggest the influence of pollutants. (See also W79-00218) (Lynch-Wisconsin)

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOUR-ISM. 3. ATTACHED ALGAE COMMUNITIES IN THE STREAM RYBI POTOK (THE HIGH TATRA MTS, POLAND) POLLUTED WITH DOMESTIC SEWAGE, Polish Academy of Sciences, Krakow, Zaklad Biologii Wod.

Polish Academy of Sciences, Krakow, Zakiad Biologii Wod. B. Kawecka. Acta Hydrobiologica, Vol 19, No 3, p 271-292, 1977. 6 fig. 2 tab. 42 ref.

Descriptors: *Rybi Potok(Poland), *Algae, *Water pollution effects, *Bioindicators, *Diatoms, *Succession, *Eutrophication, *Poland, Streams, Mountains, Tatra Mountains, Benthic flora, Sewage disposal, Tourism, Chrysophyta, Mineralization, Self-purification, Fungi, Biomass, Dominant organisms, Annual, Floral lists, Trophic level, Lake Morskie Oko(Poland), Biocenoses.

The succession of attached algal communities along the course of the Rybi Potok, a mountain stream in Poland's Tatra National Park polluted at its source by sewage from a shelter serving over one million tourists annually, is described. Four areas with characteristic vegetative communities are distinguished: (1) Station 1, an oligotrophic environment above the sewage outlet, dominated by the cyanophyte Calothrix gypsophila, and the diatoms Tabellaria flocculosa, Achnanthes microcephala, A. minutissima, and Synedra ulna. (2) Stations 2 and 3, a highly eutrophic 30-m section below the outlet dominated by the cyanophyte Phormidium favosum, the fungus Leptomitus lacteus, and the diatoms Cymbella ventricosa, Navicula cryptocephala, Nitzschin palea, and Gomphonema spp. (3) Stations 4 and 5, the zone of final sewage mineralization extending to 500 m from the outlet, with development of the chrysophytes Hydrurus foetidus and Homoeothrix janthina, and presence of the diatoms Fragilaria capucina, Ceratoneis arcus, and Cymbella vertricosa. (4) Station 6, an oligotrophic segment about 2.7 km downstream, dominated by the chrysophytes Hydrurus foetidus and Homoeothrix janthina, and the diatoms Ceratoneis arcus, Diatoma hiemale, D. hiemale var. mesodon, Coconeis placentula var. euglypta, Achnanthes minutissima, and A. microcephala. Of 153 taxonomic units identified, diatoms constituted 86.3%, chrysophytes 4.6%, rhodophytes 1.3%, and yellow-brown algae and fungi 0.6%. Quantitative changes in the annual cycle and ecological characteristics are described. (Lynch-Wisconsin)

BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOUR-ISM. 4. THE BOTTOM FAUNA OF THE STREAM RYBI POTOK (THE HIGH TATRA MTS),

MTS), Polish Academy of Science, Krakow. Zaklad Biologii Wod. A. Kownacki.

Acta Hydrobiologica, Vol 19, No 3, p 293-312, 1977. 3 fig, 1 tab, 37 ref.

Descriptors:
Potok(Poland),
*Water pollution effects,
*Bioindicators,
*Sewage disposal,
*Insects,
*Eutrophication, Invertebrates, Streams, Mountains,
Tatra Mountains,
*Poland,
Tourism,
Biocenoses, Chironomidae, Faunal lists, Mayflies,
Self-purification, Larvae, Succession.

Bottom fauna of the Rybi Potok, a mountain stream in Poland's Tatra National Park-polluted at its source by sewage from an intensively used tourist shelter-was sampled 1971-72 to study pollution effects. Characteristic zoocenoses permitted four zones to be distinguished: (1) A septic zone one meter from the sewage discharge, with larvae of the genus Psychoda (Diptera) dominant (2) A zone of strong pollution 3-10 m below the outlet, dominated by Ostracoda, Oligochaeta, Ne-

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p 293-312,

*Rybi n effects,
*Insects,
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a mountain ark--polluted ensively used to study poll: (1) A septic scharge, with ra) dominant. m below the matoda, and the chironomids Prodiamesa olivacea, Paratanytarsus sp, and Chironomus gr. thummi. (3) A zone of self-purification 30-500 m below the outlet characterized by vigorous increase in total fauna, and dominated by the chironomids Orthocladinae juv., Thienemanniella sp, and Microcricotopus sp. (4) A pure montane stream zone sampled about 2.7 km below the outlet, typical of other Tatra Mountain streams, dominated by the mayfly Baetis alpianus and thehironomids Orthocladius rivicula and O. saxosus. The 113% gradient in Zone 4 influences the fauna as significantly as the change in sewage concentration. The stream rises from Lake Morskie Oko at an altitude of 1393 m, flows across a wide terrace, and then spreads to form the Rybie Stawki with a depth of about 3 m. Subsequently the stream be sarrows, its gradient increasing rapidly, and the stream rushes down, breaking over huge boulders. After four km, it enters the Bialka River at an altitude of 1085 m. Fauna unique to the four zones are discussed in detail. (Lynch-Wisconsin)

CONTINUOUS CULTURE OF MARINE DIATOMS UNDER SILICON LIMITATION. 3. A MODEL OF SI-LIMITED DIATOM GROWTH, Washington Univ., Seattle. Dept. of Oceanography.
C.O. Davis, N. F. Breitner, and P. J. Harrison.
Limnology and Oceanography, Vol 23, No 1,
January 1978, p 41-52. 6 fig, 3 tab, 32 ref.

Descriptors: *Diatoms, *Silicon, *Limiting fac-tors, *Model studies, *Plant growth, *Skeletonema costatum, Algae, Cultures, Marine algae, Simulation analysis, Mathematical models, Silicic acid, Absorption, Michaelis-Menten equa-tion, Silica, Frustules, Light intensity, Chaetocero debilis, Thalassiosira gravida, Phytoplankton, Chemostats.

A model based on a recently-confirmed biochemical framework by Werner (1966) and on extensive experiments with Skeletonema costatum, Chaetoceros debilis, and Thalassiosira gravida, was developed for simulating silicon-limited diatom growth, in which silicic acid uptake is described by Michaelis-Menten kinetics. The model was specifically designed to simulate steady-state and transient behavior of a silicon-limited diatom population propulation pr stream state and transition frowing in a chemostat. Simulations compared with actual chemostat results indicate the model realistically represents diatom response. As diatoms require silicon to synthesize frustules, it can be assumed that silicon synthesize frustules, it can be assumed that silicon supply as orthosilicic acid can at times limit growth. Utilization of silicon within the cell is a function of silicon available in small intracellular pools, while growth is a function of silica in the frustule. Uptake is frequently limited by the siliciton utilization rate within the cell, which may be set by enzymes, or more likely one key enzyme, which regulate the process of frustule formation. Other factors, such as light or other nutrients, may also limit growth, and in turn may limit silicon utilization within the cell and silicic acid uptake. All chemostat verification testing was done with S. utilization within the cell and since and update.
All chemostat verification testing was done with S. costatum grown at 18C under continuous light. The chemostat perturbation technique was the principal subject of the modeling experiments. (See also W73-14188) (Lynch-Wisconsin)

CRITERIA DOCUMENT FOR DDT.
Environmental Protection Agency, Washington,
DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A.
W79-00276

SPECIES DIVERSITY INDICES OF THE FISH POPULATIONS OF STREAMS DRAINING SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION FLORIDA, Air Force Armament Lab., Eglin AFB., FL. For primary bibliographic entry see Field 7C.

W79-00277

MICROBIAL DEGRADATION OF DDT, Cornell Univ. Agricultural Experiment Station, Ithaca, NY. Dept. of Agronomy. M. Alexander.

M. Alexander.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026

575, Price codes: A03 in paper copy, A01 in microfiche. Department of the Navy, Office of Naval Research, Annual Report No 4, p 45 p, July 1976. 10 fig, 12 tab, 19 ref.

Descriptors: "Microbial degradation, "DDT, *Bacteria, "Fungi, "Pseudomonas, Biodegrada-tion, Metabolism, Chlorinated hydrocarbon pesti-cides, Pesticides, Pesticide kinetics, Path of pollu-tants, Organic pesticides, Organic compounds, Gas chromatography, DDD, DDE, "DDM, "DDA, "DBP, "DBH.

The products formed in the metabolism of DDT by bacteria and fungi were identified as 1,1-dichloro-2, 2-bis(P-chlorophenyl)ethane, 1,1-dichloro-2,2-bis(P-chlorophenyl)ethylene, DDM, DBH, and DBP. Several other, as yet uncharacterized products were also synthesized by these microorganisms. The compounds identified during the degradation of DDT metabolites were: DDM, DBH, and DBP from DDA; DBH and DBP from DDM. An important metabolite reported for the first time with fungi is P-chlorophenylacetic acid (PCPA), a ring cleavage product generated in the degradation of DDM. P-Chlorophenylglyoxaldehyde is also reported for the first time as a product of ring cleavage. (EIS-Deal) Deal) W79-00278

Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. For primary bibliographic entry see Field 5A. W79-00281

FOR CRITERIA DOCUMENTS FOR AL-DRIN/DIELDRIN. Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. For primary bibliographic entry see Field 5A. W79-00282 DOCUMENTS

PRELIMINARY STUDY OF SELECTED POTEN-PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS OPTICAL BRIGHTENERS, METHYL
CHLOROFORM, TRI-CHLOROETHYLENE,
TETRACHLOROETHYLENE AND ION
EXCHANGE RESINS,
Franklin Inst. Research Labs., Philadelphia, PA. Science Information Services Dept.
For primary bibliographic entry see Field 5A.
W79-00283

A PERIPHYTIC MICROFLORA ANALYSIS OF THE COLORADO RIVER AND MAJOR TRIBU-TARIES IN GRAND CANYON AND VICINITY, Northern Arizona Univ. Flagstaff. Dept. of Biological Science. For primary bibliographic entry see Field 5A. W79-00285

A FIRST ORDER MASS BALANCE MODEL FOR THE SOURCES DISTRIBUTION AND FATE OF PCBS IN THE ENVIRONMENT, Versar, Inc., Springfield, VA. For primary bibliographic entry see Field 5B. W79-00289

ASSESSMENT OF THE ENVIRONMENTAL IM-PACTS ON THE BAN ON IMPORTS OF PCBS, Versar, Inc., Springfield, VA. For primary bibliographic entry see Field 5G.

W79-00290

BIOLOGICAL EFFECTS AND ENVIRONMEN-TAL ASPECTS OF 1,3-BUTADIENE, Radian Corp., Austin, TX. T. B. Parsons, and G. E. Wilkins. Available from the National Technical Informa-Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-253 982, Price codes: A04 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-560/2-76-004, 52 p, May 1976. 4 tab, 108 ref.

Descriptors: "Human pathology, "Toxicity, "Chemical properties, "Synthetic rubber, Animal pathology, Organic compounds, Chemical analysis, Reproduction, Animal physiology, Respiration, Animal metabolism, Environmental effects, Path of pollutants, Industrial wastes, Chemical wastes, "Butadiene.

This report is a summary of the literature on the biological effects and environmental aspects of 1,3-butadiene. It was prepared from articles and abstracts identified through a search of the technical literature. The report contains information on the effects of 1,3-butadiene in environmental samples and on the reactivity of 1,3-butadiene in en-vironmental media. (EIS-Deal)

STUDIES IN MICROBIAL CHEMOTACTIC BEHAVIOR IN SEAWATER, Harvard Univ., Cambridge, MA. Div. of Engineering and Applied Physics.
R. Mitchell, I. Chet, and P. Asketh.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A026 834, Price codes: A03 in paper copy, A01 in microfiche. Technical Report No. 7, 30 p. January 1976. 6 fig. 4 tab, 25 ref.

1976. 6 fig, 4 tab, 25 ref.

Descriptors: *Toxicity, *Marine microorganisms, *Pseudomonas, Water pollution effects, Aquatic bacteria, Amino acids, Biochemistry, Organic compounds, Oil, Oil pollution, Biodegradation, Metabolism, Cytological studies, Nutrients, *Chemotaxis.

This report describes our research into detrimental effects on marine microbial processes of sub-lethal concentrations of pollutants. In the first sec-tion of this report we outline a technique for isola-tion of specific marine chemotactic bacteria capa-ble of both finding a chemical and utilizing it as a substrate. In the second section of the report we describe the results of our study of the relationship between chemical structures of attractants and chemotaxis of marine bacteria. The third phase of the research described in this report involved a study of the effects of sub-lethal concentrations of petroleum hydrocarbons on organic matter decom-position in seawater. We concluded from these studies that chemotaxis inhibition by sub-lethal levels of pollutants retards organic matter decom-position in seawater. (EIS-Deal) W79-00293

ENVIRONMENTAL EFFECTS OF SCHUYL-KILL OIL SPILL II, JUNE 1972. Environmental Protection Agency, Washington, DC. Spills Prevention and Control Board. DC. Spins reveation and Control Board. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-258 412, Price codes: A10 in paper copy, A01 in microfiche. Report EPA-430/9-75-019, December 1975. 205 p, 52 fig, 8 tab, 6 app, 28 ref.

Descriptors: *Lead, *Oil, *Oil pollution, *Oil spills, Organic compounds, Path of pollutants, Aromatic compounds, Heavy metals, Public health, Potable water, Water analysis, Chemical analysis, Zinc, Benthic fauna, Sediments, Floods, Water pollution effects, Aquatic plants, Pennsylvania, *Aliphatic compounds, *Schuylkill vania, *A River(Penn).

Group 5C-Effects Of Pollution

The fate and effects of a spill of six to eight million gallons of waste crankcase oil refined sludge into the Schuykill River, Pa., in June of 1972 have been studied. The spilled oil contained high concentrations of heavy metals and aliphatic and aromatic hydrocarbons. The spill occurred during a flood, and riverbank trees were coated with oil. Levels of lead vere higher in downstream trees; however, no direct permanent effects were noted. Levels of heavy metals in river waters remained below those set by the U.S. Public Health Service for drinking water supplies; however, higher concentrations of lead and zinc were observed downstream. Levels of lead in sediments were higher downstream. Concentrations of petroleum hydrocarbons in sediments were higher downstream. Concentrations of petroleum hydrocarbons in sediment were higher at downstream stations. Concentrations of lead in downstream stations. Concentrations of lead in downstream benthic macrofauna were higher. (EIS-Deal)

PCB IN WATER, A BIBLIOGRAPHY, VOLUME

3.
Office of Water Research and Technology,
Washington, DC.
For primary bibliographic entry see Field 5A.
W79-00305

ANNUAL SUBSURFACE TRANSPORT OF A RED TIDE DINOFLAGELLATE TO ITS BLOOM AREA: WATER CIRCULATION PATTERNS AND ORGANISM DISTRIBUTIONS IN THE CHESAPE AFE BAY

CHESAPEAKE BAY,
Johns Hopkins Univ., Baltimore, MD. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore,
MD. Dept. of Biology,
M. A. Tyler, and H. H. Seliger.

Limnology and Oceanography, Vol. 23, No. 2, p 227-246, March 1978. 15 fig, 50 ref. ERDA EY-76-S-02-3278

Descriptors: *Red tide, *Dinoflagellates, *Chesapeake Bay, Water circulation, Biological properties, Chlorophyll, Coasts, Tidal waters, Circulation, Water transfer, Depth, Bays, Estuaries, Biology, Marine biology, *Prorocentrum.

An annual, long-range, subsurface transport of Prorocentrum mariae-lebouriae, from the mouth of the Chesapeake Bay to its bloom area in the upper bay, a distance of 240 km, was described and documented completely. Prorocentrum in surface outflowing waters at the mouth of the bay is recruited in late winter into more dense inflowing coastal waters. Strong stratification produced by later winter-early spring surface runoff results in the development of a stable pycnocline. Prorocentrum, now in northward-flowing bottom waters, is retained in these bottom waters. It accumulates in a subsurface concentration maximum below the pycnocline and is transported northward to reach its bloom area in the Patapsco River and north of the Bay Bridge by late spring. The rapidly decreasing depth of the upper bay causes the pycnocline to rise, mixing the previously light-limited Prorocentrum and its nutrient-rich bottom waters to the surface, where rapid growth ensues. Once the dinoflagellate is in surface waters, positive photo-taxis, combined with both wind- and tidedriven surface convergences, produce dense surface patches or red tides. Prorocentrum is retained effectively in the bay until late winter by sequential inoculation into the tributary estuaries on the western shore, which exchange relatively slowly with bay waters. By late winter the annual cycle is complete. Prorocentrum is again in surface waters at the mouth of the bay where it is reintroduced into northward-flowing bottom waters. The mechanisms described provide a key to understanding the origins of subsurface chlorophyll maxima and the delivery of toxic dinoflagellates to constal bloom even. (Sime 1899) coastal bloom areas. (Sims-ISWS)

THE BIOLOGICAL EFFECTS OF TOXIC MATERIAL SPILLS,

Environmental Protection Agency, Edison, NJ. R. J. Nadeau.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9853-0178 (\$0.75). In: Water -- 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 7-10, 1978, 12 ref.

Descriptors: *Water pollution effect, *Toxicity, *Chemicals, *Ecosystems, Aquatic life, Fish kills, Water pollution, Environment, Phytotoxicity, Biological toxicity, Pollutants.

The environmental impact of toxic material spills depends on both the physical characteristics of the material and the environmental conditions at the time. This point is demonstrated by a discussion of certain general biological toxicity response mechanisms. For example, water soluble substances are likely to produce a stronger and more widespread effect than non-soluble substances. However, non-soluble materials can travel down a stream as an undiluted mass or slug, killing organisms in its path on contact. In other cases, a non-soluble material may be miscible forming a coating over the surface which asphyxiates or prevents proper feeding of some organisms. Toxic substances may act directly to kill life forms and juvenile stages are usually the most sensitive. Toxic substances may also act indirectly by destroying food sources or by reducing resistance to infection and stress. Recovery of damaged ecosystems is discussed with emphasis on the feasibility and desirability of intervening to aid or speed restoration. Careful analyses of genetic, physiological, and ecological factors are essential to deciding where, when, and how restoration attempts should be made. (See also W79-00342) (Majtenyi-IPA)

SAFETY ASPECTS OF TOXIC AND HAZARDOUS SPILLS, Wood (William S.) and Associates, West Chester,

For primary bibliographic entry see Field 5G. w79-00345

EFFECT OF WHEY APPLICATION ON CHEMI-CAL PROPERTIES OF SOILS AND CROPS, Kraft, Inc., Glenview, IL. For primary bibliographic entry see Field 5E. W79-00363

BIOLOGICALLY ACTIVE SUBSTANCES IN PULPING WASTE LIQUORS. I. SUBSTANCES ACTIVE AGAINST TERMITES, COPTOTERMES FORMOSANUS SHIRAKI, IN KRAFT PULPING AND BLEACHING WASTES, KGChi [Jiniy [Janan]]

Kochi Univ. (Japan).
For primary bibliographic entry see Field 5D.

BIOASSAY RESULTS OF KRAFT MILL EF-FLUENT AT ARTIFICIALLY ELEVATED LEVELS OF BIOSOLIDS,

National Council of the Paper Industry for Air and Stream Improvement, Inc., New York, A. L. Caron, E. L. Owens, and W. Seim, NCASI Stream Improvement Technical Bulletin, No. 307, 12 p, March, 1978. 2 fig. 6 ref., 2 tab.

Descriptors: *Pulp wastes, *Water pollution effects, *Fish, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Chinook salmon, Aquatic arimals, Aquatic life, Salmon, *Bioassay, Suspended solids, Water pollution, Fishkill, Resin acids.

Total fish (Fall Chinook salmon) survival occurred in the 96-hr bioassay when a biologically treated unbleached kraft mill effluent was fortified with nonsettleable biosolids which reached a concentration of 9,800 ppm. Studies carried out forperiods of 10 and 12 days showed no significant effects of biologically treated effluent containing up
to 20 ppm suspended solids on growth rates. The
total resin acid concentration in the bioassay solutions was about 36 mg/liter or 36 times that which
produces a bioassay response in straight biologically treated kraft mill effluent. The resin acids associated with residual biosolids do not have the
same effect on fish as those residing in the dissolved form. Any benefits assigned to resin acids
reduction in effluents that are associated with a
reduction in suspended biosolids by filtration are
considered to be minimal or nonexistent.
(Swichtenberg-IPC)

A STUDY OF THE FATE OF BIOSOLIDS FROM BIOLOGICALLY TREATED EFFLUENT IN LABORATORY AND CONSTRUCTED STREAMS,
National Council of the Paper Industry for Air and

National Council of the Paper Industry for All and Stream Improvement, Inc., New York. D. L. Borton, H. Costa, and W. Green. NCASI Stream Improvement Technical Bulletin, No. 308, 18 p, April, 1978. 4 fig. 6 ref., 1 tab.

Descriptors: "Pulp wastes, "Water pollution effects, "Aquatic life, Wastes, Industrial wastes, Water pollution sources, Effluents, Pulp and paper industry, Suspended solids, Aerated lagoons, Bacteria, Periphyton, Invertebrates, Food chains, Organic matter, Oxidation lagoons, Carbon radioisotopes, Radioisotopes, Aquatic animals.

Carbon-14 labeled suspended solids from a laboratory aerated stabilization basin fed bleached kraft mill effluent were introduced into laboratory streams, and their uptake into the periphyton and macroinvertebrate community was monitored. Over 95% of the biosolids measured as total suspended solids (TSS) in the full-scale and laboratory stabilization basins were of bacterial origin. Some biosolids were quickly ingested by a variety of invertebrates, including both grazing and filter feeding organisms. Some organic materials from the ingested biosolids were incorporated into invertebrate tissue, demonstrating one pathway of their incorporation into the aquatic food chain. The introduction of 1-2 mg/liter of TSS into the streams for over two years did not result in measurable differences in the amount of organic matter accumulated on the bottom. (Witt-IPC) W79-00407

BIOLOGICAL EVALUATION OF ACUTE TOX-ICITY OF SELECTED FINISHING AGENTS (BIOLOGICZNA OCENA TOKSYCZNOSCI OS-TREJ WYBRANYCH SRODKOW POMOCNIC-ZYCH), Medical Academy, Lodz (Poland).

Rechard Academy, Louz (roam). B. Strzelecka, H. Hubner, T. Jankowska, and J. Rouba. Przeglad Włokienniczy, Vol. 32, No. 2, p 74-76, February, 1978. 7 ref., 2 tab.

Descriptors: "Textiles, "Water pollution effects, "Toxicity, Wastes, Industrial wastes, Anions, Cations, Aquatic life, Fishm, Crustaceans, Worms, Invertebrates, Aquatic animals, Effluents, Weter pollution sources, Water pollution.

Eighteen commercial cationic, anionic, and nonionic agents used in textile finishing and processing were tested for their toxicity to aquatic organisms (the worm Lumbriculus variegatus, Daphnia magna, the crustacean Asellus aquaticus, and the fish Lebistes reticulatus). All agents are characterized by slow biodegradability and are currently discharged into waterways with industrial effluents. Depending on the test organism, the LC(50)/96-hr toxic levels ranged from 0.004 to 4238 g/liter, the toxicity of most agents being high. The cationic agents were highly toxic for the lower organisms, while fish were affected more by

anionic agents NWS, should these ag W79-00

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W79-004

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

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Effects Of Pollution-Group 5C

anionic agents. It is suggested that the least toxic agents should be used in finishing (e.g., Erional NWS, Utinal 302, and softener IW) and an attempt should be made to reduce the concentration of these agents in the effluents. (Stapinski-IPC)

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SURVIVAL AND EARLY GROWTH OF SELECTED TREES ON WASTE WATER APPLI-CATION SITES, North Central Forest Experiment Station, St. Paul, MN.

For primary bibliographic entry see Field 5E. W79-00422

A NOTE ON EFFECTS OF SEWAGE EF-FLUENT IRRIGATION ON SPECIFIC GRAVI-TY AND GROWTH RATE OF WHITE AND RED OAKS, Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife. For primary bibliographic entry see Field SE. W79-00425

AQUATIC INHABITANTS OF A MINE WASTE

STREAM IN ARIZONA,
Arizona State Univ., Tempe. Dept. of Zoology.
M. Lewis.

Department of Agriculture, Forest Service, Research Note RM-349, 7 p, November, 1977. 1 fig, 3 illus. 12 ref, 3 tab.

Descriptors: *Mine wastes, *Aquatic life, *Water pollution effects, *Arizona, *Copper, Water pollu-tion sources, Heavy metals, Biota, Water quality, Water pollution, Wastes, Industrial wastes, Suspended solids, Benthic flora, Benthic fauna, Flow, Flow rates, Metals, Manganese, Zinc, Iron, Sodium, Calcium, Magnesium, Fish, Bottom sediments, Geomorphology, Aquatic hibitats.

Changes in biotic composition and water quality in a copper mine waste stream were monitored before and after a large discharge of waste altered the stream's geomorphology and water quality. The stream carries effluents from a mine tailings pond into Pinto Creek. Initial water quality and biotic composition in the waste stream resembled those in a control stream; however, after the waste influx, biotic diversity was reduced and water quality was degraded. Suspended solids as high as 4,480 mg/liter (mean, 2,300 mg/liter) during the disturbance settled and quickly blanketed the stream bed and buried benthic vegetation and invertebrates. Flow at this time (20 liters/sec) and subsequently (less than 8 liters/sec) was insubsequently (less than 8 liters/sec) was in-adequate to completely scour the deposits. As a result, biotic composition in the lower stream area l year after the dam rupture was approximately 42% less than before the disturbance. Metal residues (Cu, Mn, Zn, Fe, Mg, Ca, Na) in invertebrates, aquatic vegetation, fish, and sediments from the waste stream were significantly higher than those in similar species from unpolluted streams. The effect of these residues on biotic survival was not yet discernible. (Witt-IPC)
W79-00426

HYDROCHEMICAL INFLUENCES ON THE FISHERY WITHIN THE PHOSPHATE MINING AREA OF EASTERN IDAHO,

Intermountain Forest and Range Experiment Sta-

tion, Ogden, UT.

W. S. Platts, and S. B. Martin.

Department of Agriculture, Forest Service,
Research Note INT-246, 15 p., May. 1978. 1 fig. 19
ref, 6 tab.

Descriptors: *Fish, *Phosphates, *Mine wastes, *Water pollution effects, *Idaho, Water quality, Heavy metals, Water pollution sources, Cutthroat trout, Trout, Aquatic animals, Aquatic life, Fresh-water fish, Water pollution, *Blackfoot River(Idaho), Surface mining.

Water analyses of selected streams in the upper Blackfoot River drainage area (in the Caribou National Forest, Diamond Creek Planning Unit, Idaho) showed these streams to be in a near-natural state, with possible modification from surrounding land uses. Physical conditions of fish in these streams were good. No influences from present phosphate mining were found that threatened fish health or survival. Hydrochemically, the Blackfoot system is capable of producing a good cutthroat trout fishery, but high levels of nutrients probably restrict optimum fish populations. (Witt-IPC)

THE EFFECT OF REDUCED WETLANDS AND STORAGE BASINS ON THE SIZE, STABILITY AND PRODUCTIVITY OF THE WATERSHED MIXING ZONE,

Connecticut Univ., Storrs. Inst. of Water Resources.

For primary bibliographic entry see Field 2L. W79-00441

MUSCULIUM TRANSVERSUM IN THE IL-LINOIS RIVER AND AN ACUTE POTASSIUM BIOASSAY METHOD FOR THE SPECIES, Western Illinois Univ., Macomb.

K. B. Anderson. Available from the National Technical Informa-Available that the National Technical Information Service, Springfield, VA 22161 as PB-288 088, Price codes: A05 in paper copy, A01 in microfiche. M.S. Thesis, 1977. 79 p., 12 fig, 21 tab, 37 ref, 2 append. OWRT B-097-ILL(3).

Descriptors: *Bioassay, *Potassium, Toxicity, Water quality, Water pollution effects, Rivers, *Pollutant identification, *Clams, Fingernail clam,

The status of Musculium transversum in the Il-linois River was investigated in the fall of 1975 by making 3 to 5 Ekman grabs at 20 stations in the Illinois River from mile 18.9 to 277. The findings in-dicate that M. transversum is restricted to the lower 107 miles of the river at densities of 25.8 to 43.1/m2. Compared with past data the population is greatly reduced, particularly in the middle Illinois River. Other organisms collected were categorized according to major taxonomic groups. An acute bioassay method, utilizing static and continuous-flow systems, was developed for M. trans-versum to enable investigation of the possible cause of the decline. Potassium was the first toxicaute of the decime. Potassium was the first toxicant to be studied. The results indicated a lethal threshold of 200 mg/l potassium for adults and probable lethal thresholds of 250 and 290 mg/l potassium for juveniles. Adults responded 5 to 1.6 times faster to potassium in water with a hardness of 243 mg/l as CaCO3 than in water with a hardness of 314 mg/l as CaCO3. Juveniles responded significantly faster at a test temperature of 16.7C than at 6.5C. Potassium concentrations found in water collected near the surface of the Illinois River were not in the acutely lethal range for M. transversum in the laboratory. However, before potassium can be eliminated as a possible cause of decline, a study of the chronic effects of the potas-sium levels found in the Illinois River must be completed. W79-00443

INFLUENCE OF NITROGEN FERTILIZATION ON THE QUALITY AND QUANTITY OF STREAMFLOW FROM A FORESTED

NATERSHED,
Kentucky University, Lexington, Water
Resources Research Institute.
For primary bibliographic entry see Field 5B.
W79-00448

A COMPARATIVE IN VITRO STUDY OF THE EFFECTS OF VARIOUS BALANCED SALINE

SOLUTIONS ON RESPIRATION RATES OF LIVER TISSUES OF THREE FISH SPECIES, Tennessee Technological Univ., Cookeville.

P. D. Cothron.
Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 139, Price codes: A04 in paper copy, A01 in microfiche. MS Thesis, June 1977. 54 p, 13 tab, 28 ref, append. OWRT A-034 TENN(1).

Descriptors: Balanced saline, Respiration, Fish, Respirometric media, Water pollution effects, *Fish tissue respiration, Pollutant identification, *Tissue bioassay, *Bioassay techniques.

A balanced saline solution for fish tissues was needed for use in a series of manometric experiments dealing with oxygen uptake by fish liver. Using literature values, several balanced saline solutions were postulated and were compared to Krebs-Ringer Phosphate. Results of this research indicated that differences in the basic fish and mammalian salines tested did not significantly affect cellular respiration in fish liver mince. In liver tissues which contained sufficient oxidizable subtissues which contained sufficient oxidizable sub-strate, presence or absence of glucose and dif-ferences in ionic constitutents of the fish and mammalian solutions tested had no effect on cellumammanan solutions tested had no effect on ceiture tassue mince during a 45 minute period. In cells apparently lacking sufficient oxidizable substate, glucose-containing media produced results significantly different from those yielded by non-glucose-containing media. Effects of pH and of temperature were observed. served. W79-00454

GENETIC AND ENVIRONMENTAL FACTORS GENETIC AND ENVIRONMENTAL FACTORS
INVOLVED IN INCREASED RESISTANCE OF
BROOK TROUT TO SULFURIC ACID SOLUTIONS AND MINE ACID POLLUTED WATERS,
Pennsylvania State Univ., University Park. Dept.
of Biology.
F. A. Swarts, J. E. Dunson, and J. E. Wright, Jr.

F.A. Swarts, J. E. Dunson, and J. E. Wright, Jr. Available from the National Technical Information Service, Springfield, VA 22161 as P-288 219, Price codes: A05 in paper copy, A01 in microfiche. Research Project Technical Completion Report, Inst. for Research on Land and Water Resources, University Park, PA, September 1978. 94 p, 2 fig, 17 tab, 51 ref., 2 append. OWRT A-042-PA(5). 14-34-0001-6039.

Descriptors: *Brook trout, *Acidic water, *Hydrogen ion concentration, *Acid mine water, Juvenile trout, Equilibrium, Water pollution effects, *Wild brook trout, Hatchery fish, Embryonic, Adult brook trout, Sodium loss, Sex, Survival ability, Hereditary resistance, Low pH, Sul-furic acid solution.

Several strains of hatchery-reared brook trout several strains of natchery-feared prook trout were exposed to low PH in the laboratory and in the field. Wild brook trout were also used in some field tests. Tests were both acute and chronic Pronounced strain differences in survival ability were detected among embryonic, juvenile, and adult brook trout in laboratory tests, and among juvenile brook trout in field tests. Fish had longer resistance times in sulfuric acid solutions and in mine acid polluted water if they were held previously in, respectively, pH 8 laboratory water, or non-acidic field environments. Wild brook trout non-acidic field environments. Wild brook trout survived longer at lethal field pH levels than hatchery fish which were tested immediately upon transport from the hatchery. Development of embryonic brook trout was delayed in sulfuric acidications of low pH. The time to loss of equilibrium at low pH was well correlated with total survival time. The rate of net sodium loss at low pH was investigated with the resistance times. was inversely correlated with the resistance times of brook trout. Fish had shorter resistance times in mine acid waters than in laboratory sulfuric acid solutions of comparable pH. Larger and older fish tended to survive longer. The most important factors in enhancement of acid resistance in hatchery brook trout were the hereditary resistance of a

Group 5C-Effects Of Pollution

given strain and the acclimation of fish to non-acidic stream or laboratory conditions prior to acid

ARCADIA LAKE WATER-QUALITY EVALUA-

TION,
Army Engineer Waterways Experiment Station,
Vicksburg, MS. Environmental Effects Lab.
R. W. Hall, Jr., R. H. Plumb, K. W. Thornton, R.
L. Eley, and A. S. Lessem.
Available from the National Technical Information Service, Springfield, VA 22161 as AD-A039
492, Price codes: Al4 in paper copy, A01 in
microfiche. 315 p 11 fig, 48 tab, 133 ref, 4 append.
DOL 740015.

Descriptors: "Water quality, "Mathematical models, "Nutrients, "Water chemistry, "Water properties, Model studies, Eutrophication, Chemical analysis, Water quality standards, Coliform, Pollutants, Turbidity, Algae, Urban runoff, Pesticides, Agricultural runoff, Evaluation, Lakes, Stratification, "Arcadia Lake(Oklahoma), "Lake water chemistry," "Arcadia Lake(Oklahoma), "Lake Natariake in the Natariake Chemistry," "Arcadia Lake(Oklahoma), "Lake Natariake in the Natariake Chemistry," "Natariake Chemistry," "Natariake Chemistry," "Natariake Chemistry, "Natariake Chemistry," "Natariake Chemistry, "Natariake Chemistry," "Natariake Chemistry, water chemistry, *Impoundment study, Nonpoint pollution sources.

The water quality of the proposed Arcadia Lake, Oklahoma, was evaluated relative to water quality criteria and standards appropriate for the project purposes. Study procedures included evaluation of existing data and previous studies of streams and lakes in the project area; collection and evaluation of additional field data; determination of available and limiting nutrients through algal bioassays; establishment of relationships between stream discharges and loadings of nutrients, metals, and pesticides based on stream concentrations and land-use patterns; application of various mathematical models; and comparison of predicted or measured results with existing or proposed water quality criteria. A comparison of average values for 70 water-quality parameters with the most stringent standard or criterion revealed that ammonia, manganese, mercury, DDT, dieldrin, al-drin, chlordane, lindane, heptachlor, PCB, phenols, and fecal coliforms equaled or exceeded permissible or recommended levels at least part of the time. Only coliform bacteria, ammonia, and manganese exceeded present Oklahoma standards applicable to proposed reservoir uses. Ammonia would not be expected to reach toxic concentra-tions in the hypolimnion of Arcadia Lake or to interfere with project purposes. Nutrient evaluations based on concentrations and loading in-dicated that the proposed impoundment would be eutrophic and that algal blooms were likely to occur during the late spring and summer months. Pesticides would not be expected to be a water quality problem in Arcadia Lake because sorption and precipitation would reduce concentrations significantly and restricted use of some of the pesticides has been implemented or is proposed by the EPA. Coliform bacterial contamination would be limited to the headwaters of the proposed im-poundment during base flow. (Henley-ISWS) W79-00463

NATURE AND IMPACT OF RURAL STREAM INPUTS ON WATER QUALITY, North Carolina State Univ. at Raleigh. Dept. of

Biological and Agricultural Engineering F. J. Humenik, M. R. Overcash, F. Koehler, L. Bliven, and J. W. Gilliam.

ctions of the American Society of Agricultural Engineers, Vol. 21, No. 4, p 676-681, July-August 1978. 2 fig, 4 tab, 6 ref. EPA R803328.

Descriptors: "Water quality, "Virginia, "Streams, "North Carolina, Rural areas, Streamflow, Streamflow forecasting, Water, Land use, Statistical methods, Statistics, Basins, "Rural water quality, "Stream inputs, "Chowan River Basin(NC), Soil-topographic-land use, Statistical survey, Stream reach studies, Statistical sampling.

Rural water quality was assessed by a statistical survey of small subbasins characteristic of rural areas in the Chowan River Basin, North Caro The portion of the Chowan Basin designated as study area was stratified on the basis of soil-topographic-land use factors, resulting in statistical coverage of about 25% of the 12,802 sq km (4,943 sq mi) basin. From the 4 designated strata, 15 sub basins were selected randomly to employ stratified random sampling as a monitoring strategy. Two of these subbasins were selected for intensive study of stream kinetic transformations with 6 sampling sites in a 5 km (3 mi) stream reach. After it was noted that water quality was similar in the study streams and the lower river, sampling was conducted to compare concentrations in these two areas. Also, a 32 km (20 mi) stream reach, which ided a statistical survey site, was monitored to elucidate the relative magnitude of point and non-point impacts. Long-term data for the statistical sampling survey and results from the stream reach studies were presented and discussed. (Roberts-ISWS) W79-00483

COMPARISON BY SIZE CLASS A COMPARISON BY SIZE CLASS A VOLUME OF DETRITUS VERS PHYTOPLANKTON IN CHESAPEAKE BAY, VERSUS Chesapeake Biological Lab. Solomons, MD.; and Maryland Univ., College Park. Department of Botany. For primary bibliographic entry see Field 2L. W79-00494

5D. Waste Treatment Processes

CHARACTERIZATION AND TREATMENT OF

CHARACLERIZATION AND TREATMENT OF STORMWATER RUNOFF, Colorado Univ., Boulder. Dept. of Civil Environ-mental and Architectural Engineering. For primary bibliographic entry see Field 5B. W79-00005

WATER FILTERING AND DISPENSING AP-PARATUS,

For primary bibliographic entry see Field 5F. W79-00019

METHOD OF DISPOSING OF WASTE WATER CONTAINING EMULSIFIED OIL.

Sumitomo Electric Industries Ltd., Osaka (Japan). (Assignee).

M. Noda, and K. Nomura. U.S. Patent No 4,086,164, 10 p, 2 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1431-1432, April 25, 1978

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Oil pollution, Separation techniques, Emulsions, Metal working industry, Combustion

An economical process is provided for obtaining a stable, homogenous mixture which can be burned in combustion apparatus by introducing oil containing emulsified waste water produced in work-ing metal with a water soluble lubricating oil or a water soluble cutting fluid. The oil containing emulsified waste water is concentrated to such a point that it becomes independently combustible. The surface active agent (or agents) which is present in the emulsified waste water is utilized to obtain a stable, homogeneous slurry by mixing the oily substance obtained by the concentration of the emulsified waste water with the inorganic substances obtained by filtering solid foreign bodies from the lubricating oil during metal working. The emulsified waste water is concentrated without breaking the emulsion by means of a physical-chemical apparatus which utilizes an ultra-filtra-tion membrane or other device. (Sinha-OEIS) W79-00020

TREATMENT OF SOLIDS, LIQUID-GAS MIX.

nperial Chemical Industries Ltd., London England). (Assignee).

(England). (Assignee). F. C. Roesler. U.S. Patent No. 4,086,160,7 p, 4 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 969, No 4, p 1430, April 25, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Industrial wastes, *Water pollution treatment, *Activated sludge, Separation techniques, Acration, Flotation, Sedimentation.

A solids-liquid mixture, such as waste water, con-taining biologically degradable material is treated in a circulatory system having an alternating upin a circulatory system having an alternating up-ward and downward flow kept in motion by injec-tion of gas such as air. A mixture is diverted from the system into a separating chamber in which solids-enriched mixture is separated by flotation and/or sedimentation. A solids-rich mixture, preferably recycled from the separation chamber, is fed into the system hydrostatically and thereby the concentration of such solids are transferred from one location to another without mechanical summing (Sinha-OEIS) pumping. (Sinha-OEIS) W79-00022

TREATMENT OF EFFLUENT,

C. R. Smith, and B. Mills. U.S. Patent No. 4,085,688, 9 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1277, April 25, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, Alkaline water, Hydrogen sulfide, Reduction(Chemical), Gases, Quenching, Scrubbers.

Contaminated aqueous alkali wash liquor from the treatment of gases containing hydrogen sulp and/or hydrogen cyanide is reconstituted by treat-ment at an elevated temperature in a reducing at-mosphere followed by quenching to form recon-stituted wash liquor. The contaminated liquor is concentrated, before entering the reducing at-mosphere, by direct contact with hot gases derived from the hot reducing atmosphere. Quenching and concentration are carried out by interaction of a gaseous medium with a liquid spray. Generation of the hot reducing atmosphere, reaction of the con-taminated liquor with the hot reducing at-mosphere, and concentration of the contaminated liquor may be carried out in a single chamber. (Sinha-OEIS)

TREATMENT OF LIME-SULFIDE TANNERY UNHAIRING WASTE,

Department of Agriculture, Washington, DC. Office of the Secretary. (Assignee).

M. Komanowsky, and H. I. Sinnamon.
U.S. Patent No 4,085,044, 3 p. 2 tab, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1058, April 18, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Industrial wastes, Tannery wastes, Separation techniques, Floccula-

Improvements in the treatment of lime-sulfide unhairing wastes from both salt-cured and uns hides are provided. After undissolved lime is flocculated out of the waste of a salt-cured hide and the supernatant acidified to liberate hydrogen sulfide, the hydrogen sulfide is flashed off under reduced pressure at about from 100 degrees to 150 degrees F. The waste from unsalted hides is sparged with carbon dioxide prior to flocculation, the sparged waste is flocculated with a strongly ca tionic polyelectrolyte, and the hydrogen sulfide flashed off from the acidified supernatant liquid. (Sinha-OEIS) W79-00026

CARBO Met-Pro N. H. El U.S. Pat Gazette 969, No

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bubbles as oxygen fo themselve float in the ment and f W79-00030

CLARIFIC Georgia-Pa J. A. Neal. U.S. Pater Gazette of 970, No 3,

Descriptor *Industrial Suspended lation, Ma oanic comp

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

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det-Pro Systems, Inc., Lansdale, PA. (Assignee). N. H. Ellis.

N. H. Ellis. U.S. Patent No 4,085,043, 7 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1057-1058, April 18, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, Water pollution treatment, Adsorption, *Activated carbon, Flow, Solids contack processes, Equipment, Countercurrent flow.

A method of and apparatus for handling granular carbon which is used in an adsorption process removing certain soluble organic compounds from waste water streams is described. It has been waste water streams is described. It has been found that flowing waste water through a carbon column in countercurrent contact with the flowing carbon is a good technique for contaminate removal. However in relatively small integrated, prefabricated sewage treatment plants the height of the column is a critical limitation. Special techniques are required to cause carbon to flow in a column if the column does not have a hopper bottom, agitator or vibrating mechanisms. One reason that special techniques must be used to induce carbon flow is that as carbon is removed from the carbon bed, a cavity is produced which is void of anything but water and fines. Because of this cavity, a desired ration of carbon to water flowing out of the carbon outlet port cannot be obtained. In this invention carbon is removed from the bottom of the column by a jet eductor. A the bottom of the column by a jet eductor. A source of fluidizing water is connected to the column adjacent to the eductor to prevent the formation of a cavity in the carbon bed in that area adjacent to the jet eductor. (Sinha-OEIS) W79-00028

BIOLOGICAL OXIDATION AND FLOTATION

APPARATUS AND METHOD,
FMC Corp., Chicago, IL. (Assignee).
D. G. Fullerton, G. M. Kyriss, and R. B. Weber.
U.S. Patent No. 4,085,041, 25 p., 14 fig. 8 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 1057, April 18, 1978.

Descriptors: *Patents, *Sewage treatment, *Water pollution treatment, *Waste water treatment, Biological treatment, Flotation, *Oxidation, Bubbles, Biological treatment.

Biological oxidation and flotation apparatus and method are disclosed for use in the treatment of sewage or other aqueous waste material by the ac-tivated sludge process. A treatment and flotation chamber is provided in which both biological ox-idation and flotation take place. The treatment and flotation chamber includes a quiescent zone at the top of the chamber that extends horizontally and downward at least about three inches below the surface of the contents of the chamber. The contents of the chamber below the quiescent zone are continuously recirculated. Oxygen-containing gas bubbles are introduced into the system to provide owners are introduced into the system to provide oxygen for biological treatment of the aqueous materian and to provide bubbles which attach themselves to suspended solid particles to form a float in the quiescent zone at the top of the treat-ment and floation chamber. (Sinha-OEIS) W79-00030

CLARIFICATION PROCESS, Georgia-Pacific Corp., Portland, OR. (Assignee).

J.A. Neal.
U.S. Patent No. 4,089,799, 5 p. 7 ref; Official Gazette of the United States Patent Office, Vol 970, No. 3, p. 1027, May 16, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Water pollution treatment, Suspended solids, Separation techniques, Flocculation, Magnetic properties, Ferromagnetic organic composition.

A process is described for clarification of an aqueous liquid by Flocculating the finely divided particles in the liquid into a floc having magnetic properties and employing a magnetic field to enhance the settlement or separation of the magnetic flocs. The aqueous liquid is flocculated with a metal hydroxide, a water-soluble ferromagnetic lignosulfonate, ferromagnetic sulfonated tannin, or a ferromagnetic sulfonated phenol condensed with an aldehyde. The ferromagnetic composition is added in conjunction with an insoluble metal hydroxide flocculating agent or compound. The ferromagnetic organic compositions becomes associated or combined with the floc or flocculated particles to impart magnetic characteristics to the particles. impart magnetic characteristics to the particles.

The flocculated contaminants may then be removed from the liquid by using a magnetic filed or by settling in the presence of a magnetic field which will considerably increase the rate of settlement. W79-00041

COLOR REMOVAL PROCESS, Nalco Chemical Co., Oak Brook, IL. (Assignee). J. J. Svarz, F. N. Kemmer, and J. O. Fabri. U.S. Patent No. 4,089,780, 5 p, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1027, May 16, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Pulp and paper industry, Color, Separation techniques, Chemical precipita-

Color is removed from paper mill waste waters by treatment with a cationic water soluble polyamine having an average molecular weight of at least 300 at a pH of 2 to 5, preferably 2.5 to 3.5, followed by precipitation with a water soluble anionic or nonionic organic polymer having an average molecular weight of at least 10,000. (Sinha-OEIS) W79-00042

BATTERY OPERATED WATER PURIFICA-TION SYSTEM, Sachs-Systemtechnik G.m.b.H., Schweinfurt

(West Germany).
For primary bibliographic entry see Field 5F.
W79-00043

METHOD FOR TREATING SEWAGE.

J. L. Ramer.

U.S. Patent No. 4,089,761, 4 p, 2 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1022, May 16, 1978.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Biological treatment, Aerobic conditions, Oxygenation, Electrolysis, Anodes, Cathodes, Mixing, Equipment.

A method and apparatus for treating sewage is provided by first comminuting raw sewage to provide a slurry and then digesting the raw, comminuted sewage by oxygen-dependent bacteria in a roofed compartment. Oxygen is supplied by eleca roofed compartment. Oxygen is supplied by electrolysis of the water in the sewage, utilizing spaced anode and cathode. The anode is located in the roofed digestion compartment, and the oxygen generated at the anode is used by the bacteria; the cathod is located in a chimney which extends through the roof or top of the plant, to atmosphere, and the hydrogen generated at the cathod is discharged to the atmosphere through this chimney. A stirrer is provided in the digestion compartment to stir trapped oxygen back into the mass of sludge. A trapping or sedimentation comparement is provided after the digestion compartment, for settling out indigestible solids, and drawing off the remaining liquid. (Sinha-OEIS) W79-00044

METHOD FOR CLARIFYING AQUEOUS WASTE LIQUIDS CONTAINING ACID DYES, Nippon Carbide Kogyo Kabushiki Kaisha, Tokyo. (Assignee).

M. Nakajima, and K. Kuwabara.
U.S. Patent No. 4,088,573, 6 p. 2 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 635, May 9, 1978.

Descriptors: "Patents, "Waste water treatment, "Industrial wastes, "Dyes, Water purification, Separation techniques, Chemical precipitation, Flocculation, Resins, Filtration.

A method is provided for clarifying aqueous waste liquids containing acid dyes. The optimum amount of the dicyandiamide-formaldehyde resin and at of the dicyandiamide-formaldehyde resin and at least about 300 ppm, preferably at least about 350 ppm, of aluminum sulfate, both based on 100 ppm of the dye in the waste liquid, are added sequentially. There is no limitation in the order of adding them, but either can be added first. For example, the above resin is added to the waste liquid whose pH has been adjusted to a desired value, preferably an acidic region of not more than 7, in the course of conducting the waste liquid to a sedimentation apparatus or filtration apparatus, and the mixture is stirred so as not to cause non-uniformity in concentration. This results in the formation of a flocculated matter. Then, aluminum mation of a flocculated matter. Then, aluminum sulfate is added, and the mixture is stirred somewhat slowly. The flocculated dye can be sedimented or collected by filtration. Conversely, aluminum sulfate can be added first and then the resin. (Sinha-OEIS) W79-00053

ACTIVATED SLUDGE SYSTEM WITH STAGGERED PARTITION BASIN, Air Products and Chemicals, Inc., Allentown, PA.

C. S. Block, M. S. Chen, O. J. Noichl, and S.

U.S. Patent No. 4,087,361, 6 p, 4 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 238, May 2, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Water purification, *Aeration, Settling basins, *Activated sludge, Mixing, Equipment.

A method and apparatus is provided for aerating mixed liquor in an activated sludge waste treat-ment system with aeration gas in which the geometry of the basin, and the mode of operation geometry of the basin, and the mode of operation of te aerators aerating the mixed liquor, produce a series of liqid zones through which the mixed liquor flows in a generally serpentine manner from one noncompletely mixed liquor zone to the next such that the degree of effective liqid staging is greater than that achieved before. As a result, significantly more efficient purification of the influent wastewater stream can be achieved. (Sinha-OEIS)
W79-00055

PROCESS FOR REMOVING MERCURY AND MERCURY SALTS FROM LIQUID EF-

FLUENTS, Montedison S.p.A., Milan (Italy). (Assignee). G. Patron, D. Napoli, F. Nardone, G. Ratti, and G.

U.S. Patent No. 4,087,359, 4 p, 13 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Mercury, Separation techniques, Chemical reactions, Chemical precipitation, Coagulation.

A process is described in which mercury is removed from liquid effluents by precipitation with the use of only one reagent, regardless of the form in which the mercury is present. The mercury

Group 5D—Waste Treatment Processes

is removed in such a form as to separable from the is removed in such a toria as to separate from the effluents by simple clari-flocculation. The mercury is effectively removed without prior remova of the suspended mud and inert products by filtering upstream from the purification plant. The process is accomplished by reacting the effluent, at a pH of from 9 to 14, with thiourea or with a hydroxylamine salt to precipitate the mercury and/or merylamine salt to precipitate the mercury and/or mer-cury derivatives and then separating the precipitate, together with muds and inert products, if any, by simple clari-flocculation. When thiourea is fed into waters containing mercury and/or mer-cury salts, it functions both as a precipitating agent and as a reducing agent and as a reducing agent for oxidizers, such as chlorine, which may be present. Hydroxaylamine serves as both a precipitating agent for forming highly insoluble amino-mercury salts and as a reducing agent which originates metallic mercury from mercury derivatives. (Sinha-OEIS) W79-00056

WATER REUSE AT HIGHWAY REST AREAS:

EVALUATION PHASE, Virginia Highway and Transportation Research ncil, Charlottesville

C. E. Parker.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-278 542, Price codes: A03 in paper copy, A01 in microfiche. Report VHTRC 78-R22, December 1977, 89 p, 24 fig, 21 tab, 7 ref, 4 append. HPR 1397 (C).

Descriptors: "Water reuse, "Water conservation, "Waste water treatment, "Rest areas, Filtration, Closed loop system, Granular filter, Biological oxidation, Biological treatment, Nitrification, Nitrates, Nitrites, Ammonia, Sewage, Sewage effluent, Aeration, Waste treatment, Water treatment, Highways, Chemical reactions, Recycling.

A system for recycling water used to flush water closets at a highway rest area on I-81 at Fairfield Virginia, is evaluated. The method produces water of acceptable standards with no objectional odor or color, no foaming or apparent suspended solids and having low bacterial count. Preliminary benchscale research indicated that extended aeration biological treatment followed by granular media filtration would be acceptable. This led to installation of a full-scale field system at an existing rest area. A closed loop system was set up to and from water closets, with water balance achieved by wasting an amount of recycled water equal to th water input from sewered potable water. Equilibrium was achieved and recycling was estimated at 95%. Operation of the closed loop extended aeration and granular filter system was similar to contion and granular litter system was animal to ventional operation of these processes. The influence of nitrogen accounted for the most significant operating difference. Ammonia nitrogen transformation to nitrite and nitrate nitrogen resulted in an operating pH of 5.5 to 6.0 and, as a result, incomplete nitrification occurred. Although nitrogen buildup in the form of ammonia, nitrite and nitrate did occur, the concentrations did not cause a reduction in organic biological oxidation efficiency. Quality of the water varied between winter and summer operation, but remained acceptable as a flush fluid. (Majtenyi-IPA) W79-00087

TRANSPIRATION AND EVAPORATION OF SEWAGE EFFLUENT,

Auburn Univ., AL. Engineering Experiment Sta-

S. R. Jenkins, and F. J. Molz.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-278 389, Price codes: A05 in paper copy, A01 in microfiche. Report HPR No. 81, December 1976. 75 p, 20 fig, 61 ref, 4 append. 930-074.

Descriptors: "Sewage treatment, "Sewage disposal, "Sewage effluents, "Spray irrigation, "Liquid wastes, "Evapotranspiration, Environ-*Sewage

nental sanitation, Evaporation, Transpiration Highways, Waste water treatment, Waste water disposal, Irrigation, Spraying.

Experimental efforts to develop better methods of treating liquid wastes from roadside comfort sta-tions are described. Existing methods of treating such wastes are often costly to operate and main such wastes are often costly to operate and main-tain and may not meet new State and Federal restrictions on waste discharges from lagoons and septic tanks. These experiments were aimed at developing practical, zero-discharge procedures for utilizing the evapotranspiration phenomenon to dispose of sewage effluent. In one experiment, impervious evapotranspiration units were con structed in rectangular excavations. Both raw domestic waste and settled domestic waste were pumped into or sprayed onto the units and the evapotranspiration rate was determined through a water balance. In a second experiment, effli from a two-stage lagoon was sprayed on an area planted with grass and shrubs. Tests indicate that a 20,000 gallon per day comfort station would require a spray area of about five acres. It is concluded that such disposal systems are practical for many areas of the state, and that a well-designed, lagoon-fed spray irrigation system will be an economical, ecologically-sound method for disposing of liquid wastes from roadside rest areas. Such systems require little maintenance and blend in with the landscaping normally found at such comfort stations. (Majtenyi-IPA)

ENERGY CONSUMPTION OF ADVANCED WASTEWATER TREATMENT AT ELY, MIN-NESOTA, Corvallis Environmental Research Lab., OR

D. J. Hernandez.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-278 270, Price codes: A03 in paper copy, A01 in microfiche. Report No. EPA-600/7-78-001, Jan 1978, 20 p, 1 fig. 6 tab. 10 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Energy consumption, *Ely, MN, Sludge pumping, Vacuum filtering, Sewage, Sewage treatment, Waste water, Municipal wastes, Sludge treatment, Primary productivity, Waste treatment, Water treatment.

Energy use at the advanced waste water treatment plant in Ely, MN, is analyzed and discussed under three categories; plant operation, support services, and indirect use. Some historical background is provided along with a description of the plant facilities. Direct energy utilization is defined as that actually involved in operating pumps, motors, chemical feed equipment, lighting, and heating. Energy used during primary, secondary, and tertiary plant treatments is noted. In addition, other energy consuming operations, such as sludge pumping and vacuum filtering are outlined in detail. Calculations for estimating energy consumption are supplied for direct energy use-age only; however, indirect energy requirements that include energy consumed in making or processing materials used at the Ely plant, are probably greater. (Majtenyi-IPA) W79-00102

ADSORPTION OF SOME TOXIC SUBSTANCES BY WASTE COMPONENTS.

Waste Research Unit, Oxon (England). Harwell Lab

For primary bibliographic entry see Field 5B. W79-00152

DEGRADATION OF AQUEOUS PHENOL SOLUTION BY GAMMA IRRADIATION, Hiroshima Univ., (Japan). Inst. of Environmental

Chemistry. K. Sato, K. Takimoto, and S. Tsuda.

Environmental Science and Technology, Vol. 12, No. 9, p 1043-1046, September, 1978. 6 fig. 2 tab,

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Descriptors: "Phenols, "Gamma rays, *Irradiation, "Chemical degradation, "Chemical wastes, Aqueous solutions, "Oxygenation, Chro-matography, Infrared radiation, Mass spec-trometry, Analytical techniques, Carbon dioxide, Waste water treatment, Industrial wastes.

The degradation products of an oxygenated phenoi solution, gamma-irradiated with 53,000 rad/hr, were identified by high-speed liquid chromatography. Phenol degradation by irradiation followed the first order, yielding p-benzoquinone, hydroquinone, and catechol. Ether extraction of the first peak, representing a mixture of polar compounds, yielded eight additional peaks; these were identified by ultraviolet spectrophotometry as 0,0°-biphenol, catechol, maleic acid hydroquinone, and 1,2,4-trihydroxybenzene. Two unidentified peaks were further analyzed by infrared and mass spectrometry. One peak resembled either a muconic acid, aliphatic acid, or aldehyde; the other red-brown hydrazone was thought to have two carbonyl groups and at least denyae; the other rea-forwa nyuazone was thought to have two carbonyl groups and at least two hydroxyl groups. Phenol consumption from 10, 50, 100, and 1000 ppm solutions indicated that the potential for recombination of irradiation-sup-plied radicals was greater at lower phenol concenplied radicals was greater at lower phenol concentrations. The number of phenol molecules destroyed per unit dose decreased with the residual phenol level in solutions bearing more than 50 ppm phenol; the degradation percentage increased as the phenol concentration decreased. Total organic carbon degradation decreased with increasing irradiation dosage. About 95% phenol consumption was required before total organic carbon was reduced; a radiation dose five times that needed to consume 95% of the phenol was carbon was required; a radiation dose live times that needed to consume 95% of the phenol was required to convert phenol to carbon dioxide. At 60-70% phenol consumption, a secondary degradation of the primary products, catechol and hydroquinone, occurred. (Lisk-FIRL) W79-00153

CONTROLS DRIVE PLATERS TO MATERIALS

J. J. Obrzut. Iron Age, Vol. 221, No. 33, p 35-36, 38-39, August, 1978. 2 fig, 4 tab.

*Nickel. Descriptors: Metals, *Chromium, *Electrodialysis, *Reverse osmosis, *Electrodialysis, exchange, Chemical, Phosphorus comp Reverse osmosis, Chemical precipitation, Activated carbon, Ozone, Evaporators, Cadmium, Copper, Lead, Zinc, Mer-cury, Waste water treatment, Industrial wastes.

Processes to recover metals from electroplating effluents have been devised for compliance with stricter waste water discharge and toxic sub-stances controls. Tubular, spiral-wound, and hol-low-fine-fiber reverse osmosis units have been tested by the EPA for the recovery and recycling of process chemicals. The reverse osmosis permeate is returned to the rinsing tanks and metal concentrates are returned to the plating baths. Electrodialysis, especially following reverse os-mosis, has been tested for treating concentrated effluents. Electrodialysis in conjunction with ion flotation has been effective in concentrating fluoborate reagents; the success of this treatment fluoborate reagents; the success of this treatment process may encourage the replacement of cyanide with fluoborate. Electrodialysis may also be applicable to recovery of hexavalent chromium and nickel from plating effluents. Evaporators for chromic acid recovery have reduced the acid requirements at one plant by 80%; evaporators are also being used to treat phosphate cleaning solutions. tions. At ion exchange system also recovers phosphoric acid used in the bright finishing of alu-minum; the reciprocating flow ion exchange system removes nickel salts from rinses. Iron sulfide precipitation is recommended for mixed metal effluents; activated carbon and ozone treatment of plating wastes are also considered feasible, (Lisk-FIRL) W79-00154

Vol. 12, ig, 2 tab,

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REMOVAL OF COMPLEX COPPER-AMMONIA IONS FROM AQUEOUS WASTES WITH FLY ASH,

Tennessee Valley Authority, Chattanooga. Div. of

Testuessee valley Authority, Chattanooga. Div. of Environmental Planning. T-Y. Chu, G. R. Steiner, and C. L. McEntyre. Journal Water Pollution Control Federation, Vol. 50, No. 9, p 2157-2174, September, 1978. 17 fig, 5 tab, 29 ref.

Descriptors: "Copper, "Ammonia, "Fly ash, "Chemical precipitation, "Waste dilution, Adsorption, Alkalinity, Ammonium compounds, Bonding, Chemical properties, Metals, Waste water treatment, Industrial wastes.

The use of alkaline fly ash sluice water to dilute ammoniated-bromate metal cleaning wastes can reduce residual copper levels to within 1.0 mg/liter, as mandated by EPA guidelines. Fly ash sluice water pH, initial copper concentration, ammonia-to-copper mole ratio in the waste water, copper precipitation by alkalinity, copper adsorption on fly ash, and retention time are investigated as factors influencing the efficiency of copper and ammonia removal. Theoretical copper residual curves after ash waste treatment are developed for various ratios of copper, ranging 0.001-0.01 mole, to ammonia, ranging 0.05-0.4 mole at pH>6. At pH 11, an initial copper concentration of 100 mg/liter and an ammonia-to-copper mole ratio of 40 in a waste stream should not require dilution to produce a residual of 1.0 mg copper/liter; dilution is required for higher copper concentrations. The capacity of fly ash to adsorb copper increases with increasing pH (11 to 11.9) and fly ash concentration; copper precipitation decreases from 98.28 to tion; copper precipitation decreases from 98.28 to 94.84% as pH increases from 11 to 11.9. The op-98.44% as pH increases from 11 to 11.9. The op-timum parameters for removing copper and am-monia from metal cleaning waste streams include: dilution in an ash pond with a pH greater than 8.5; a fly ash concentration of 1.7% in the raw fly ash sluice water; and a retention time of 4-10 hrs. (Lisk-FIRL)

THE ENVIRONMENTAL EFFECTS CHROMIUM IN TANNERY EFFLUENTS, Barrie Tanning Ltd. (Ontario). For primary bibliographic entry see Field 5C. W79-00156

RECOVERY OF TIN FROM ELECTROPLAT-ING SOLUTIONS AND RINSE WATERS, Wollongong Univ. (Australia). Dept. of Chemistry. J. Ellis, and R. W. Whitton. Effluent and Water Treatment Journal, Vol. 18, No. 8, p 389-391, August, 1978. 3 fig, 3 tab, 9 ref.

Descriptors: "Tin, "Solubility, "Alkalis(Bases), "Sodium compounds, "Chemical precipitation, Magnesium, Calcium, Iron compounds, Colloids, Metals, Waste water treatment, Industrial wastes.

Laboratory tests investigated the parameters in-fluencing the solubility of hydrous tin oxides (HTO), precipitated from spent electrotinning effluent, in aqueous alkaline solutions. A typical spent electroplating stream, bearing 1.3 g/liter of tin(II), 0.5 g/liter of tin(IV), and 2.1 g/liter of fluoride, was treated with solid Na2CO3 to precipitate HTO; the resulting concentrated slurry was tested for solubility in alkalis by mixing a 100 ml aliquot with 100 ml of a NaOH solution. After heating and filtration, 10 ml aliquots of the suspension and filtrate were mixed with concentrated H2SO4, HCl, and distilled water; the tin was reduced to tin(II) by boiling and each solution was titrated with a KIO3 solution. Alkaline solubility was expressed as a function of the titrametric endpoints of both solutions; HTO was examined with aboratory tests investigated the parameters in-

a scanning electron microscope, X-ray fluorescence, and an electron microprobe. The precipitated HTO contained small amounts of Na, K, Fe, Si, Mg, Ca, Al, and other heavy metals. The adsorption of Ca and Mg ions onto HTO(IV) enhanced solubility; the presence of colloidal iron compounds improved solubility slightly. The HTO(IV) solubility in alkali was severely reduced the metal temperatures above 50C in the strictly was relatively HTO(IV) solubility in alkali was severely reduced at temperatures above 50C; tin(II) was relatively unaffected by temperature, although solubility decreased at higher Mg and Ca concentrations. The alkali solubility of HTO was slightly enhanced by the addition of a nonionic polyacrylamide. The ratio of tin(II) to tin(IV) in the electroplating effluent had a strong influence on alkali solubility. (Lisk-FIRL)

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART 2, American Cyanamid Co., Stamford, CT. For primary bibliographic entry see Field 5G.

THE EFFECT OF CYCLOHEXANE DERIVA-TIVES ON SELECTION OF BACTERIAL GROUPS FORMING ACTIVATED SLUDGE MICROFLORA, Warsaw Univ. (Poland). Dept. of Environmental Microbiology. A. Bisz-Konarzewska. Acta Microbiologica Polonica, Vol. 27, No. 2, p 155-160, 1978. 4 fig, 1 tab, 12 ref.

Descriptors: *Activated sludge, *Oil wastes, *Oil industry, *Pseudomonas, *Inhibition, Enteric bacteria, Cultures, Microorganisms, Incubation, Microbial degradation, Dominant organisms, Waste water treatment, Industrial wastes.

The presence of cyclohexane derivatives in oil waste favored the growth of Pseudomonas bacteria during activated sludge treatment. Both gram-negative and positive bacteria representing three Pseudomonas groups, contained in activated sludge with Enterobacteriaceae, Vibrio-Aeromonas, Achromobacter-Alcaligenes, and Flavobacterium, were exposed to 30, 100, and 200 mg/liter of cyclohexanol, cyclohexanon, ocyclohexylamine in a basal medium. Pseudomonas comprised more than 50% of the gram-negative bacteria which accounted for 90-97% of the total population. After 7 days of growth in the unspiked comprised more than 30% of the gram-tegative bacteria which accounted for 90-97% of the total population. After 7 days of growth in the unspiked basal medium, Pseudomonas predominated, grampositive bacteria diminished, and Flavobacterium was completely eliminated. Other gram-negative bacteria were hindered by the presence of cyclohexane derivatives after 7 days of incubation. Pseudomonas comprised 75-91% of the population grown in the presence of cyclohexanol, 93-97% in the cyclohexanon medium, and 76-99% in the cyclohexanon medium, and 76-99% in the cyclohexanon medium, Enterobacteriaceae, Vibrio-Aeromonas, and Achromobacter-Alcaligenes comprised 23-36% of the total population; their proportions were similar in the presence of cyclohexanol. Cyclohexanon and cyclohexanol. Cyclohexanon and cyclohexanol. Explohexanon and cyclohexanol. FIRL) W79-00159

CONTROLLING AND MONITORING ACTIVATED-SLUDGE UNITS, Polybac Corp., New York. G. T. Thibault, and K. D. Tracy. Chemical Engineering, Vol. 85, No. 20, p 155-160, September, 1978. 11 fig, 13 ref.

Descriptors: "Activated sludge, "Oil wastes, "Oil industry, "Organic loading, "Toxicity, Oxygen demand, Dissolved oxygen, Growth rates, Biological treatment, Microbial degradation, Waste assimilative capacity, Waste water treatment, Sulfides, Industrial wastes.

Process monitoring and control techniques for refinery waste activated sludge units can prevent retinery waste activated studge units can prevent system upsets caused by organic and toxic shock loads. Cyanide shocks can cause a rapid decrease in the microbialgrowth rate and dissolved oxygen uptake rate (DOUR); sulfides also inhibit the growth rate but increase the DOUR. Maintaining a constant solids residence time (SRT) is equivalent growth rate but increase the DOUR. Maintaining a constant solids residence time (SRT) is equivalent to maintaining a constant microbial growth rate. The resistance of refinery activated sludge to shock loads increases as the SRT increases from 5 to 25 days. Clarifiers are usually designed to operate at a solids flux of 15-25 lbs/sq ft/day; solids flux is defined as the product of the influent flow rate, recycle rate, and total aeration basin suspended solids per unit surface area of the clarifier. Frequent monitoring of the DOUR and the total oxygen demand (TOD) or total organic carbon (TOC) in the feed stream can signal on-line changes in the growth rate. By monitoring the DOUR:TOD or TOC ratio, organic toxic loading can be detected; for toxic shocks caused by chemically oxidyzable sulfide, TOC must be monitored. Sludge wasting should cease at the onset of both toxic and organic shocks; additions of powdered activated carbon may protect microbial viability during toxic shocks. Dissolved oxygen should be maintained above 0.5 mg/liter during organic shocks. Shock loads can be effectively controlled by diverting toxic streams to holding basins and by diverting toxic streams to holding basins and organic streams to the aeration basin exit to reduce organic stre solids flux.

REMOVAL OF AMMONIUM SULFIDE FROM WASTEWATER BY LIQUID MEMBRANE PROCESS,

Exxon Research and Engineering Co., Linden, NJ. R. P. Cahn, N. N. Li, and R. M. Minday. Environmental Science and Technology, Vol. 12, No. 9, p 1051-1056, September, 1978. 6 fig. 3 tab, 9

Descriptors: *Ammonium compounds, *Hydrogen sulfide, *Oily water, *Emulsions, *Permeability, Liquids, Steam, Permselective membranes, Separation techniques, Oil wastes, Oil industry, Waste water treatment, Industrial wastes.

Extripping, a liquid membrane process, has been developed to simultaneously extract ammonia from aqueous solutions and air- or steam-strip hydrogen sulfide from refinery sour water streams. Extripping utilizes a water-in-oil emul-sion as the liquid membrane and a dissociated acid, such as sulfuric acid; under agitation, the oil acid, such as suiture acid; under agitation, the oil emulsion forms droplets which surround the aid. Operated at 80 C, the extripping tower receives a stream of air, steam, or flue gas through its base as the ammonium sulfate effluent stream is introduced through the top of the column. Ammonia molecules permeate across the liquid membrane molecules permeate across the liquid membrane where they are neutralized and ionized by the acid; ammonia diffusion across the membrane into the emulsion droplets will continue as long as the undissociated ammonia concentration in the external phase is higher than the internal emulsion droplet concentration. The pH drops as ammonia permea-tion increases and the external concentration tion increases and the external concentration decreases, contributing to an increase in undissociated H2S and enhanced stripping. H2S-laden gas is passed through a condenser for reflux of all residual ammonia and then to a Claus plant for sulfur recovery. When a regenerable acid is used, ammonia is separated from the emulsion by heating; a sulfuric acid-bearing emulsion is broken to recover an ammonium sulfate solution suitable as a fertilizer. Extripping can achieve 95% or more removal in 10 min and 99% or more removal in 20 min.

W79-00161

NEKOOSA CLEANS CONDENSATES WITH

NEKOOSA CLEANS CONDENSATES WITH STEAM DISTILLATION, Mo Do Mekan, London(Ontario). T. Burgess, and D. Voight. Pulp and Paper Canada, Vol. 79, No. 8, p 72-74, August, 1978. 1 fig, 3 tab.

Group 5D-Waste Treatment Processes

*Steam, Descriptors: *Distillation "Steam, "Condensation, "Pulp wastes, Pulp and paper industry, Sulfur compounds, Gases, Incineration, Heating, Organic compounds, Separation techniques, Waste water treatment, Industrial

A distillation column at Nekoosa Papers Inc.'s A distillation column at recoorsi repers inc. s kraft mill in Wisconsin steam strips methanol, tur-pentine, and total reduced sulfur compounds (TRS) from digester blow gas, and foul conden-sates from turpentine recovery, and black liquor evaporation. The total condensate volume was reduced by separating the condensates from the multiple effect evaporators and by replacing the multiple effect evaporators and by replacing the direct contact pre-coolers and intercondensers in the evaporators with indirect types. These modifications reduced the condensate to a flow of 336 gal/min, bearing 500 ppm TRS, 540 ppm turpentine, and 1800 ppm methanol. About 29,000 lbs steam/hr were needed in the distillation column to remove 90% of the methanol and all of the TRS and turpentine; by placing the 8-ft diameter, 60-ft high column between the first and second effects of the multiple evaporators, steam was supplied to the stripping column at lower costs. The condensate passes through a fiber strainer to remove particles prior to heating to 220 F in a heat exchanger. ticles prior to heating to 220 F in a heat exchanger. The condensate enters the top of the stainless steal distillation column and is stripped of contaminants as it passes down through the trays. The stripped pollutants and foul gases comprise the primary fuel in a fume incinerator which converts the products to water vapor, carbon dioxide, and sufur dioxide at nearly 100% efficiency. Clean condensate passes through the heat exchanger to heat densate passes inrough the neat exchanger to hear incoming condensate and is returned to the brown stock area for hot water tank makeup. Steam distillation reduces BOD by 85%, methanol by 85%, and sulfide by 99% after black liquor oxida-

W79-00162

September, 1978. 1 fig.

COLLECTING BARK BURNER ASH WITH ELECTROSTATIC PRECIPITATORS. arch-Cottrell, Inc., Bound Brook, NJ. Paper Trade Journal, Vol. 162, No. 18, p 56-57,

Descriptors: *Pulp and paper industry, *Electrodes, *Dusts, *Bark, *Wood wastes, Air pollution, Resistivity, Electrical resistance, Boilers, Separation techniques, Ionization, Pollution abatement, Industrial wastes

Electrostatic precipitators have been installed in two pulp and paper mills to remove fly ash from bark-fired boilers. In an electrostatic precipitator, entrained dust particles are ionized as the effluent entrained dust particles are ionized as the effluent stream passes between grounded collection plates, parallel to high-voltage electrodes, and collected on the electrodes. A removal efficiency of greater than 99% is possible with coal ash. Comparison of bark ash resistivities at temperatures of 250-650 F bark ash resistivities at temperatures of 250-650 F with resistivities occurring in municipal incinerators suggested that electrostatic precipitators could efficiently function with bark ash. A hogfuel-fired pilot plant confirmed that bark ash fell within the resistivity range of the precipitator. Because of the light, flaky, and highly carbonaceous nature of the bark ash and large char natticles within the seas stream the electrostatic particles within the gas stream, the electrostatic precipitator installed in the P.H. Glatfelter Co. plant in Spring Grove, Pennsylvania, incorporated a cyclone collector to remove large chars prior to the precipitator and a small length-to-height ratio; the velocity was also reduced to prevent re-entrainment of particles by flowing gas. The Georgia Kraft Co.'s boiler streams exhibited a bark ash re-sistivity of 8.74 billion ohms/cm and a coal ash re-sistivity of 85 billion ohms/cm; the bark ash was found to have a modulating effect on more re-sistant materials. A comparative survey indicated that precipitators had moderate installation costs and lower operating costs than fabric filters and scrubbers W79-00163

HE RADIATION-INDUCED DEGRADATION OF LIGNIN IN AQUEOUS SOLUTIONS, Oji Paper Co. Ltd., (Tokyo) Japan.
T. Nagai, and N. Suzuki.
International Journal of Applied Radiation and Isotopes, Vol. 29, No. 4/5, p 255-259, 1978. 9 fig, 11 ref. THE RADIATION-INDUCED DEGRADATION

Descriptors: *Gamma rays, *Irradiation, *Optical properties, *Lignins, *Pulp wastes, Color, Organic compounds, Absorption, Oxygen, Nitrogen, Carbon dioxide, Chemical degradation, Oxidation, Pulp and paper industry, Waste water treatment, Industrial wastes.

Gamma irradiation in the presence of oxygen and nitrogen monoxide degraded sodium ligno sulfonate in aqueous solutions comparable to pulping waste water. A 200 ml aliquot of an aqueous solution bearing 100 ppm sodium ligno sulfonate was irradiated at room temperature with cobalt-60 gamma rays at dosages of 190,000 and 1,100,000 rad/hr; oxygen was bubbled through the liquid and, in some experiments, nitrogen or N20 was inrad/hr; oxygen was bubbled through the liquid and, in some experiments, nitrogen or N2O was introduced. Absorption bands at 202.5 and 280 nm decreased with increasing irradiation dose and nearly disappeared at 5,500,000 rad for oxygen-aturated solutions; the reduction in optical density at 202.5 mm was greater for the N2O-saturated solution than for the oxygen- or nitrogen-saturated solutions. At 400 nm, the optical density in oxygen-saturated solutions at 400 nm, the optical density in oxygen-saturated solutions increased with doses per ygen-saturated solutions increased with doses up to 1,100,000 rad and decreased with further irradiation; color nearly disappeared at 16,500,000 rad. The presence of normal-alcohols in nitrogen-saturated solutions significantly enhanced removal of color from 2,000 ppm lignin solutions at 1,100,000 rad. Addition of 60 millimoles of propyl alcohol increased color removal to 67%, compared alcohol increased color removal to 67%, compared to 33% for non-alcoholic solutions. Oxygen-saturated solutions exhibited the greatest reduction in total organic carbon and generated the largest quantity of carbon dioxide. The pH of oxygenated solutions decreased sharply with doses up to 1,100,000 rad, but gradually increased above 2,000,000 rad; this phenomenon was attributed to the oxidation of organic acids. (Lisk-FIRL) W79-00164

WASTE WATER TREATMENT AND RE-USE WITHIN THE TEXTILE INDUSTRY,

M. T. Turner. Water Services, Vol. 82, No. 990, p 527-528, August, 1978. 2 fig, 5 tab.

Descriptors: *Textiles, *Color, *Flocculation, *Coagulation, *Flotation, Dyes, Chemical oxygen demand, Water reuse, Lime, Polyelectrolytes, Settling basins, Turbidity, Waste water treatment,

Aluminum sulfate flocculation and dissolved air flotation were selected by a textile mill in North Lancashire, England, for recycling processing ef-fluents. The colored effluent, flowing at a rate of 79.5 cu m/hr, contained about 2,566 mg COD/litery. reductions to 250 mg COD/liter were necessary for reuse. Aluminum sulfate was selected as a floccu-lant over ferric and ferrous sulfate because of its lant over ferric and ferrous sulfate because of its lower dosage requirements. Effluent is held in a flow balancing tank/sump for 45 min before it is transported by a submerged centrifugal pump to the flocculation tank. About 250 mg/liter of a 7.5% aluminum sulfate solution and 150 mg/liter of a lime slurry are added to the effluent which is retained in the tank for 15 min. About 1 mg/liter of solutions to the floculated flower than the flower of the flower than the flower polyelectrolyte is added to the flocculated effluent as it flows by gravity to the dissolved air flotation cell. The flotation cell has a central diffusion drum, a bottom subnatant collection system, and an ejector to dissolve the air into the effluent stream A flight scream removes floating materials. stream. A flight scraper removes floating material which is discarded; subnatant passes through a turbidimeter prior to lagooning for reuse. Costs for recycling the treated effluent are about 25% of those for discharging raw sewage. (Lisk-FIRL)

TEXTILE WASTE WATERS: TREATMENT AND ENVIRONMENTAL EFFECTS,
Water Pollution Research Lab., Stevenage For primary bibliographic entry see Field 3E. W79-00166

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HYDROLYSIS OF IRON FROM ACIDIC LIQUORS, Arizona Univ., Tuscon. Dept. of Chemical En-

gineering.
A. D. Randolph, and R. D. Williams.
A. D. Randolph, and R. D. Williams.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 523, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/2-78-143, July 1978. 46 p, 9 fig, 6 tab, 10 ref, 3 append. R-802390.

Descriptors: "Water pollution treatment, "Waste water treatment, "Acid streams, "Iron oxides, "Crystallization, "Ferric oxide, "Iron removal, "Hydrolysis, "Chemical precipitation, Water purification, Sulfuric acid, Copper, Iron compounds, Copper leach solutions, Industrial wastes.

A bench-scale procedure which uses a retained solids crystallization process to increase the iron removal rate from acidic process liquors is described. This increased removal rate with retained solids results in lower solution concentrations of iron. The solid product formed is called alpha hematite (Fe203) and is suitable for iron alpha hematite (Fe203) and is suitable for iron smelting. At the same time, sulfuric acid is regenerated for recycling to the leaching process. This process provides high yield iron removal under less severe conditions than those required for present continuous crystallization technology. for present continuous crystallization technology. A 2-gallon continuous pressurized reactor was built, capable of processing free acid and ferric iron concentrations up to 20 and 30 g/l, respectively, at temperatures of 135C to 165C. Ferrous iron was oxidized to ferric by overpressure of oxygen and oxidation rates were enhanced by oxygen aparaging. The iron oxide was contaminated with a small amount of sulfate ion, but was practically free of other metal ions. (Majtenyi-IPA) W79-00228

ECONOMIC ANALYSIS OF SELECTED FEA-TURES OF MUNICIPAL WASTEWATER CONSTRUCTION GRANT LEGISLATION, Environmental Research Center, Research Triange Park, NC

For primary bibliographic entry see Field 5G. W79-00246

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED TREATMENT FACILI-TIES, 1974 'NEEDS' SURVEY, FINAL REPORT TO THE CONGRESS.

Environmental Protection Agency, Washington, DC. Municipal Construction Div. For primary bibliographic entry see Field 5G. W79-00248

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2. Office of Water Research and Technology,

Washington, DC.

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-287 921, Price codes: A10 in paper copy, A01 in microfiche. Water Resources Scientific Information Center, Report OWRT/WRSIC 78-204, July 1978. 89 p. 3

Descriptors: "Ozone, "Bibliographies, "Water treatment, "Waste water treatment, Disinfection, Oxidation, Sewage treatment, Ozonation.

This report, containing 239 abstracts, is another in a series of planned bibliographies in water resources produced from the information base comprising SELECTED WATER RESOURCES

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TE WATER, VOLUME 2. Technology,

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ABSTRACTS (SWRA). Volume 1 (see W78-07251) covers the information announced in SWRA from October 1968 to December 1973. Volume 2 covers the period from January 1974 to April 1978. Author and subject indexes are inciuaea. W79-00306

WATER -- 1977. American Inst. of Chemical Engineers, New York. AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, 1978, 321 p.

Descriptors: "Waste water treatment, "Water pol-lution, "Industrial wastes, "Activated sludge, "Power plants, "Sludge treatment, "Filtration, "Solvent extraction, "Ozone, "Odor, "Froth flota-tion, Leachates, Ionizing radiation, Tertiary treat-ment, Controls, Ion exchange, Mathematical models, Cost-benefit analysis, Management.

This collection of 36 papers on the subject of This conection of 30 papers on the subject of water treatment focuses on areas such as toxic materials control, biological treatment, electric power generating plant waste water treatment, physical chemical processes, destruction of contaminants, disinfection and odor control, and air flotation. Toxic materials control covers such substants and subjects to the subject of the sub jects as monitoring toxic spills, biological effects of toxic materials, and safety aspects, and control and treatment of toxic substances. Biological waste water treatment deals with: activated sludge waste water treatment deals with: activated sludge methods; ion exchange/adsorption models in relation to virus transport in percolating beds; and tertiary alum-mud precipitation. Electric power generating plant waste water treatment covers wastes from fossil-fueled plants, recovery of vanadium originating as impurities in oil, dewatering of sludges, ash disposal, land application on farmland. Physical chemical processes includes developments in oil interception by filtration, pH control using carbon dioxide, solvent extraction, and staged ultrafiltration. Ozone technology is represented with papers on pretreatment of industrial wastes, comparison of ozone and ultraviolet radiation for oxidation of waste waters and disinfection, and destruction of toxic compounds by radiation for oxidation of waste waters and disinfection, and destruction of toxic compounds by ionizing radiation. Disinfection and odor control includes papers on on-site generation of hypochlorite solutions by electrolysis of seawater, and odor problems. Also included are papers on induced air flotation performance, sorption capabilities of various materials for treating leachates, and removal of fluoborate from electroplating wastes. (See W79-00343 thru W79-00378) (Majtenyi-IPA) W79-00342

MANAGEMENT PLAN FOR CONTROL AND TREATMENT OF TOXIC SUBSTANCES, Research Corp. of New England, Wethersfield,

For primary bibliographic entry see Field 5G. W79-00346

THE UNOX PROCESS: EFFECTIVE WASTE-WATER TREATMENT PRACTICE, Union Carbide Corp., South Charleston, WV. R.C. Vaseleski.

R.C. Vaseleski.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9770-0178 (\$0.95). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 23-28, 1978, 1fig, 3 tab, 12 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Water purification, *Water pollution treatment, *UNOX, *Oxygenation, Biological treatment, Microbial degradation, Sludge, Microorganisms, Aerobic bacteria, Aerobic conditions, Biological oxygen demand.

The UNOX process is described as an improvement on the currently accepted system of supplying microorganisms with oxygen during the ac-

tivated sludge process for waste water purification. Instead of adding air to supply dissolved oxygen, UNOX uses high purity oxygen. As in other
activated sludge systems, UNOX is composed of a
biological reactor and a sedimentation tank. The
biological reactor and a sedimentation tank. The
biological reactor is divided into completely mixed
stages by interior walls and is completely covered
to provide a gas-tight enclosure. Liquid and gas
phases flow concurrently through the reactor.
Waste water, oxygen, and recycled sludge enter
the first stage; however, oxygen enters at a slight
pressure of 1-4 inches water column gage and
flows from stage to stage with enough velocity to
prevent backmixing. Because oxygen demand
decreases as waste water progresses through the
reactor, the net flow rate of gas is determined by
the rate of gas mass transfer at each stage. An advantage of the system is that the high liquid phase
dissolved oxygen provides a healthier biomass,
which in turn, makes possible smaller tankage,
smaller clarifiers, smaller dewatering equipment,
and lower disposal costs. In addition, peak versus
average load design is possible because the system
can be allowed to drop to a dissolved oxygen of 2-3
during peak loading andlor oxygen feet can be incan be allowed to drop to a dissolved oxygen of 2-3 during peak loading and/or oxygen feed can be in-creased. Such options do not exist with an air system. (See also W79-00342) (Majtenyi-IPA) W79-00347

COMPARISON OF COMPLETE MIXED ACTIVATED SLUDGE AND UNOX TREATMENT

TIVATED SLUDGE AND UNOX TREATMENT OF BREWERY WASTES, Flood and Associates, Inc., Jacksonville, FL. B. A. Bell, and J. M. Welday.
Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9550-0178 (51.05).
In: Water – 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 29-36, 1978, 8 fig. 2 tab. 4 ref.

Descriptors: "Activated sludge, "Waste water treatment, "UNOX, "Oxygenation, "Waste treatment, "Water pollution treatment, Effluents, Aeration, Microbial degradation, Sludge, Aerobic bacteria, Biological oxygen demand, Wastes, Biological treatment, Brewery wastes.

A waste water treatment plant in Jacksonville, Florida, was the site of a study comparing the mixed activated sludge process and UNOX treatments of wastes. Although some results are described concerning the plant's original contact stabilization process, most interesting findings are those obtained during 1974 and 1975 when the plant was oversted when the six fed exitivated. those obtained during 19/4 and 19/5 when the plant was operated using the air-fed activated sludge process and 1975 to 1977 when it was operated using oxygen-free UNOX process. Major waste materials handled by this plant (Sewer District 2 Wastewater Treatment Plant) is brewery effluent which is high in suspended solids and 5-day biological demand (BOD5). The UNOX system biological demand (BOD5). The UNOX system proved superior for treating both types of pollutants. UNOX was able to average over 90% suspended solids removal compared to about 65% for the air fed activated sludge system. For the BOD5 removal, UNOX achieved 97.5% removal efficiency while the activated sludge process was about 33%. It is noted that these superior results were obtained at a time when the influent quality worsened; thus, it is concluded that UNOX pure oxygen process is better suited to handling characteristic brewery wastes. (See also W79-00342) (Majtenyi-IPA)
W79-00348

UNOX WASTEWATER TREATMENT SYSTEM PERFORMANCE SILICONE CHEMICAL COM-

PLEX, Union Carbide Corp., Sistersville, WV.

A. A. Burton.

Available from Copyright Clearance Center, Inc.,
New York, NY as 0065-8812-78-9875-0178 (\$1.05).

In: Water -- 1977, AIChE Symposium Series, Vol.
74, No. 178, edited by G. F. Bennett, p 37-47, 1978,
11 fig.

Descriptors: "Activated sludge, "Waste water treatment, "Silicones, "Chemical wastes, "UNOX, Biological treatment, Aeration, Biological oxygen demand, Microbial degradation, Sludge, Separation techniques, Copper, Molds, Neutralization, Effluents, Oxygenation, Biological treatment, Alcohols, Ohio River.

cal treatment, Alcohols, Ohio River.

The design, operation, and efficiency of the UNOX waste water treatment system at Union Carbide's Sisterville, West Virginia, Silicone Chemical Plant are discussed. The major contaminants of the plant are alcohols, toluene, metals, and some silicone oils. The treatment system design includes primary clarification with pH control and secondary treatment consisting of equalization, nutrient addition, holding basin, sludge drying/holding ponds, and two circular UNOX reactors, capable of 92% removal of biological oxygen demand (BOD). Problems that had to be solved included the clarifier recycle system, which initially was a floating bridge type mechanism. When this proved unreliable, a moving boom with hard rubber-covered metal wheels was installed which has functioned successfully. Other problems involved a high copper influent level, which was solved using a copper removal system before further processing, and low winter temperatures which were corrected by adding a rotary kiln. Also, a problem involving high levels of filamentous fungi was eliminated by increasing the sludge age and the food to microorganism ratio. Safety is maintained by careful monitoring of the reactors to detect any accumulation of combusti-Safety is maintained by careful monitoring of the reactors to detect any accumulation of combusti-ble gas and incorporation of automatic failsafe devices. (See also W79-00342) (Majtenyi-IPA)

DESIGNING AND OPERATING AN OXYGEN ACTIVATED SLUDGE SYSTEM INCLUDING TERTIARY ALUM-MUD PRECIPITATION, Gulf States Paper Corp., Tuscaloosa, AL. R. Fuller, and D. W. Gilbert. Available from Copyright Clearance Center, Inc., New York, NY as 0055-8812-78-9661-0178 (\$1.25). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. /Bennett, p 48-65, 1978. 6 fig. 6 tab. 3 ref. 1978, 6 fig. 6 tab. 3 ref.

Descriptors: "Waste water treatment, "Activated sludge, "Organic wastes, "Industrial wastes, "Pulp wastes, "Alum-mud precipitation, Suspended solids, Biological treatment, Sludge, Effluents, Oxygenation, Sludge disposal, Drying, Incineration, Recycling, Dewatering, Biological oxygen demand, UNOX, Waste disposal, Pulp and paper industry."

Design of a waste disposal system for a pulp-paper complex located on a river with poor summer flow is described. The system required a special tertiary compiex rocated on a river with poor summer flow is described. The system required a special tertiary alum-mud precipitation in addition to conventional installations. The primary treatment includes a clarifier which removes 90% solids and 15% 5-day biological oxygen demand (BOD5) releasing an effluent containing 37 mg/l total suspended solids (TSS). Secondary treatment involves three UNOX oxygen activated sludge units, each of which has a throughput capacity of 10.67 million 1/day. The average reduction across the secondary system is 86% when excessive loads are applied; thus, the tertiary clarifier was designed for treatment after the secondary clarifier. In the tertiary system, residual organics, including color and suspended solids are precipitated with 'alum-mud.' Experiments determined the best filter cloth and maximum open area for best hydraulic conditions. Dried cakes from the filter press are incinerated in a six hearth furnace. Ash from the furnace then passes to acid-brick lines reactor tanks where it is treated with sulfuric acid to convert aluminum oxide in the ash back to alum. It is concluded that oxide in the ash back to alum. It is concluded that precipitation systems, such as the alum-mud system, may be valuable for other industries, other than the paper industry, which have problems controlling loads of organics and suspended solids. Costs of construction and opera-

Group 5D—Waste Treatment Processes

tion, and operating conditions and performance over a 2-year period are tabulated. Diagrams of the treatment system are supplied. (See also W79-00342) (Majtenyi-IPA) W79-00350

EFFECTS OF DISSOLVED OXYGEN IN THE OXYGENATION ACTIVATED PROCESS.

PROCESS, NUS Corp., Houston, TX. J. M. D'Antoni, and S. E. Steimle. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9823-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 66-74, 1978, 9 fig, 2 tab, 10 ref.

Descriptors: "Oxygen, "Dissolved oxygen, "Activated sludge, "Waste water treatment, "Oxygenation, Sludge, Benefits, Biological treatment, Waste water, Laboratory tests, Suspended solids. Organic loading

The benefits of using dissolved oxygen in the oxygenation activated sludge process were studied using a laboratory pilot system especially developed for the purpose. A unit module reactor system was designed and constructed based on the UNOX process and a synthetic powdered-milk based synthetic wast water was used for the study. Test runs were carried out using various suspended solids concentrations and normal dissolved oxygen concentrations and then elevated oxygen concentrations. Resuls showed that more d and intense metabolic reaction of viable or ganisms developed under elevated oxygen conditions. Next five operational parameters were chosen as practical indicators of performance: substrate removal rate, sludge yield, total oxygen consumed, sludge volume index, and sludge set-tling velocity. Results, using these parameters, are tabulated for both batch treatment and continuous flow studies and it is concluded that there were marked differences in the activated sludge process caused by increased dissolved oxygen These include improved substrate removal rates and sludge settling with reduced oxygen consump-tion and sludge yields. With increased organic and solids loadings, the benefits become more apparent, a point to be considered in designing new or upgrading existing facilities. Utilization of pure oxygen in the oxygenation process provides the ability to carry elevated levels of mixed liquor solids without developing oxygen limited condi-tions and eliminates possible oxygen stagnation. (See also W79-00342) (Majtenyi-IPA)

DYNAMICS AND CONTROL OF SUSPENDED SOLIDS IN A TWO-STEP ACTIVATED SLUDGE

Lockwood, Andrews and Newnam, Inc.,

C. R. Coneway, and J. V. Matson. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1643-0178 (\$1.05). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 75-83, 1978, 8 fig. 8 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Model studies, *Mathematical models, *Suspended solids, Sewage treatment, Municipal wastes, Houston, TX, Computer models, Waste water, Biological treatment, Sewage effluents, Waste treatment, Water pollution, Hydraulic properties.

A mathematical model for simulation of transient hydraulic peaks in the two-step oxygen activated sludge process is desc bed as part of planning for a new waste water tree trent plant in Houston, Texas. The model used "scribes one treatment train and includes both steps of the two-step process. It was developed based on mass and flow balances around each stage of the reactors and each of the clarifiers. The computer was used to perform several integrations simultaneously as required in the model. A sinusoidal flow pattern was used to simulate the diurnal variations in the incoming waste water and the simulation was con-ducted for a 48-hour period. Variations, such as peak wet weather characteristics and control acpeak wet weather characteristics and control ac-tions for distribution of sludge, were programmed into the model. Results of computer simulation are recorded graphically. Design of the clarifier was aided by this study, especially such features as the ability to withdraw sludge from clarifiers, to con-trol sludge blanket level, and to include sufficient depth to accommodate additional sludge mass resulting from above flow rate increases. Also, it resulting from abrupt flow rate increases. Also, it was demonstrated that gross process failure can occur as a result of a peak hydraulic surge through the plant. To solve this problem transfer of excess sludge to an adjoining train is recommended. (See also W79-00342) (Majtenyi-IPA) W79-00352

APPLICATION OF IOM EXCHANGE/ADSORPTION MODELS TO VIRUS TRANSPORT IN PERCOLATING BEDS, California Univ., Los Angeles. V. L. Vilker, L. H. Frommhagen, R. Kamdar, and

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9469-0178 (\$1.15). In: Water -- 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 84-92, 1978,

*Mathematical models, *Waste Descriptors: "Mathematical models, "Waste water, "Percolation, "Ion exchange, "Viruses, Leachate, Activated carbon, Packed beds, Sewage, Water treatment, Soil water movement, Groundwater, Percolating water, Sludge treat-ment, Silts, Septic tanks, Ion exchange/adsorption equaions, Adsorption, Elution, Equilibrium.

Experimental and mathematical models Experimental and mathematical models are described for predicting breakthrough of low levels of virus from percolating columns. This research is aimed at developing better methods of predicting the magnitude of the threat of virus contamination of groundwater supplies by percolation from such sources as surface spreading of untreated and treated waste water, sludge land spreading, septic tanks, and landfill leachates. It included models for both adsorption (application of waste water to an uncontaminated bed) and elution (application of clean water to contaminated tion (application of clean water to contaminated beds). The percolation/adsorption model consisted of a virus mass balance, an adsorption rate, and an equilibrium isotherm relationship. The data were obtained by measuring the equilibrium uptake of T4-phage from electrolyte solutions of known initial view. tal virus concentrations by known masses of ac-tivated carbon. The virus breakthrough is described by ion exchange/adsorption equations and the effects of external mass transfer and nonlinear adsorption isotherms are included. The pre-dicted values obtained from the model experiments agree qualitatively with experiments carried out on virus transport through laboratory columns of silty soils or activat 00342) (Majtenyi-IPA) ctivated carbon. (See also W79-W79-00353

OXYGEN ACTIVATED SLUDGE CONSIDERA-TIONS FOR INDUSTRIAL APPLICATIONS,

AWARE, Inc., Nashville, TN.
C. E. Adams, Jr., W. W. Eckenfelder, Jr., J. H.
Koon, and S. E. Shelby.
Available from Copyright Center, Inc., New York,
NY as 0065-8812-78-9754-0178 (30.95). In: Water1977, AICHE Symposium Series, Vol. 74, No. 178,
edited by G. F. Bennett, p 93-101, 1978, 9 fig, 6 ref.

Descriptors: *Activated sludge, *Waste water treatment, *Industrial waste, *Oxygenation, *Biological treatment, *Evaluation, Waste treatment, Aeration, Hydrogen ion concentration, Organic compounds, Sludge, Suspended solids,

58

Economics, Costs, Appraisals, Installation costs, Operating costs, Odor.

A number of factors are discussed which must be evaluated when assessing the relative merits of air evaluated when assessing the relative merits of air oxygenated versus pure oxygen oxygenated activated sludge systems for industrial use. Organic removal kinetics may play a more important role in treating industrial wastes than municipal wastes because of their high strength. It is shown that a higher dissolved oxygen level in the aeration basin will result in a higher resistance to organic shock loadings and a more aerobic floc. A higher temperature because of the enclosure of the aeration basin is an advantage of the pure oxygen system, especially in cold climates. Equilibrium of the aeration basin pH can be a problem with the pure oxygen system because it intails a slightly lower pH. With highly acidic industrial waste waters if may be difficult to maintain pH to an acceptable range between 6.5 and 7.5. Also, the enclosed oxygen system may result in difficulties by retaining ygen system may result in difficulties by retaining volatile organics which can inhibit the system. Pure oxygen systems are preferable to air oxygen systems for control of odors and susceptibility to shock loadings. Another factor to be considered is mixed liquor volatile suspended solids concentra-tions which can be handled effectively by both tions which can be handled effectively by both systems if they are properly designed; however, the pure oxygen system does have the advantage of being able to supply sufficient oxygen to maintain relatively high mixed liquor or solids levels without requiring use of high power levels which would promote break-up of floc particles. Economically, a pure oxygen system costs more to construct but may offer substantial savings in oversaling costs hased mostly on the power. operating costs, based mostly on the power requirements to achieve the necessary dissolved oxygen concentration. (See also W79-00342) (Majtenyi-IPA) W79-00354

TREATMENT OF LIQUID WASTES FROM FOSSIL FUEL POWER PLANTS,

Ecodyne Corp., Union, NJ. Industrial Waste

Treatment Div J. E. Brenman.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9047 (80.75). In: Water – 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 102-108, 1978,

Descriptors: *Liquid wastes, *Power plants, *Fossil fuels, *Waste treatment, *Coals, Sulfur compounds, Runoff, Suspended solids, Fly ash, Heavy metals, Oil wastes, Industrial wastes, BPCTCA, BATEA, Standards, Water quality,

Six major sources of pollution from fossil fuel power plants are discussed in relation to methods appropriate for achieving the standards described for such facilities by the Environmental Protection Agency (EPA). Recommendations are given in each category on how to meet the 'Best Practical Control Technology Currently Available' (BPCTCA) by July 1, 1977 and 'Best Available (BFCICA) by July 1, 197 and Best Avanaus Technology Economically Achievable' (BATEA) by July 1, 1983. The six pollution sources discussed are: maintenance cleaning waste, stack gas sulfur dioxide removal, coal pile and misce-laneous area run-off, fly ash treatment, bottom ash, and sanitary waste. The substances found to be of major concern are suspended solids, oils, grease, and heavy metals. Removal of these substances is discussed under each category with ulti-mate efficiency to be dictated by the specific con-ditions of its generation. The BPCTCA and BATEA guidelines are tabulated and some specific recommendations to achieve them are made and estimated efficiency is summarized. (See also W79-00342) (Majtenyi-IPA)

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Center, Inc., 47 (\$0.75). In: 102-108, 1978,

ower plants, Coals, Sulfur lids, Fly ash, strial wastes, Vater quality

om fossil fuel on to metho ards described ntal Protection are given in Best Practical y Available' Best Available ble' (BATEA) ution sources g waste, stack tment, bottom ances found to ed solids, oils, l of these subegory with ulti-BPCTCA and

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is summarized.

USE OF WASTEWATER TREATMENT PONDS USE OF WASTEWATER TREATMENT PONDS ATTVA POSSIL FUELED POWER PLANTS, Tennessee Valley Authority, Chattanooga. G. R. Steiner, and D. G. Jahnig. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1644-0178 (\$1.85).

New 4016, 19 2 3 0003-8012-70-1044-01/8 (\$1.83). In: Water - 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 109-124, 1978, 4 fig, 6 tab, 9 ref.

Descriptors: "Waste water treatment, "Power plants, "Sewage lagoons, "Fossil fuels, "Tennessee Valley Authority, Ponds, Drainage, Waste streams, Chemical wastes, Liquid wastes, Waste water (Pollution), Legislation, Sedimentation, Chemical precipitation, Absorption.

Treatment of chemical wastes produced by Tennessee Valley Authority (TVA) fossil-fueled power plants is discussed with emphasis on use of waste water ponds. Ponds are used at all TVA waste water ponds. Forms are used at all IVA
plants to treat some part of the chemical wastes including materials derived from the following
sources: ash sluice water, boiler blowdown,
chemical cleaning wastes, water treatment wastes, various drainage wastes, sulfur dioxide, and scrubber wastes. The average size of these ponds is 184 acres of 17% of total plant site area. They treat wastes by sedimentation, chemical precipitaare described in relation to compliance with Federal water pollution standards. Some important lessons for design and maintenance of treat-ment ponds are illustrated by descriptions of specific experiences at the Colbert, John Sevier, and Kingston Steam Plants. Future concerns in this area involve meeting standards required by the Safe Drinking Water Act and new Environmental Protection Agency regulations controlling toxic pollutants. (See also W79-00342) (Maitenvi-IPA) W79-00356

INSTRUMENTATION AND CONTROLS FOR PHILADELPHIA ELECTRIC COMPANY ED-DYSTONE GENERATING STATION WASTE-WATER TREATMENT SYSTEM, Philadelphia Electric Company, PA. G.J. Beck, and F. C. Gloeckler.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9489-0178 (\$0.75). Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 125-129,

Descriptors: *Waste water treatment, *Municipal waste, *Controls, *Instrumentation, *Power plants, Philadelphia, Waste water, Flow measurement, Flow control, Hydrogen ion concentration, Turbidity, Filters, Effluents, Industrial wastes, Equipment.

The design and modifications of instrumentation the design and modifications of instrumentation and controls for the Philadelphia Electric Company's Eddystone Generating Station waste water treatment system are described. Modifications were required due mostly to equipment problems and inaccurate initial influent waste flow rate determination. Four major problems arose in operating pH adjustment tanks which were corrected by minor equipment modifications. rected by minor equipment modifications and changes in controls. Difficulties encountered in reasuring controlling flow from holding tank transfer pumps to clarifier, from settling basin to the clarifier, and effluent flow to the river were described. Other problem areas were holding tank which the country of the country o described. Other problem areas were housing can-urbidity and gravity filters. Operating experience adicated that a full time plant operator is needed to insure continuous plant operation. However, the basic instrumentation and control philosophy were proved satisfactory and plant discharge quality never violated regulatory limits. (See also W79-0342) (Majtenyi-IPA)

DESIGN CONSIDERATIONS FOR WASTE-WATER TREATMENT SYSTEMS AT EXISTING FOSSIL POWER PLANTS, Stone and Webster Engineering Corp., Boston,

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Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1703-0178 (\$1.35). In: Water -- 1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 130-139,

Descriptors: *Waste water treatment, *Power plants, *Design, *Fossil fuels, Sedimentation, Neutralization, Dewatering, Sludge, Waste water, Industrial wastes, Fly ash, Evaluation, Cost analysis, Pumps, Coal, Demineralization, Separation techniques.

Several alternatives for treatment of waste waters produced by fossil-fueled power plants are described for each of several waste sources. Floor and equipment drainage usually must be treated separately because of extensive chemical and/or separately occause of extensive chemical and/or physical processes required for most other wastes. Corrugated plant interceptors and corrugated plant separators are useful for removing suspended solids and save space over conventional separa-tors. Specific recommendations are made for handling floor and equipment drainage wastes and results show flow rates from this source can be results show flow rates from this source can be reduced by 75%. Sugaestions are made for improving handling of water treatment system wastes including demineralizer wastes which may involve acid or caustic feed through a flow-through pH sensor. Equipment washing wastes cover those produced by removal of ash from equipment such as air preheaters, economizer, boiler firesides, and are civities because. Most of feetive methods of itator hoppers. Most effective methods of precipitator hoppers. Most effective methods of treating such wastes are: (1) adding dry high calcium quicklime and polyelectrolyte into a mixed tank or sump with about a 15-minute detention time and effluent pH of 9.0; (2) gravity sedimentation of solids produced from the lime addition; (3) final neutralization of resulting overflow to a pH suitable for direct discharge; (4) dewatering of collected sludge from gravity sedimentation. Each of these methods is analyzed with respect to space requirements, cost, and operating problems. Ash requirements, cost, and operating problems. Ash handling systems wastes discussed include oil fly ash and coal bottom ash. Bottom ash, in turn, is di-vided into slagging and non-slagging ash which require different treatments. (See also W79-00342) (Majtenyi-IPA) W79-00358

WASTE TREATMENT FOR A PROFIT, Long Island Lighting Co., Glenwood Landing,

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9080-0178 (\$1.25). In: Water -- 1977, AIChE, Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 140-148, 1978, 8 fig. 2 tab, 10 ref.

Descriptors: *Waste treatment, *Power plants, *Recycling, *Vanadium, Oxidation, Reduction, Hydrogen ion concentration, Acidification, Lime, Filtration, Long Island Lighting Co.(LILCO), Ferrovanadate, Industrial wastes, Oil, Pilot plants.

Recovery of valuable vanadium originating as impurities in the Venezuelan fuel oil burned at power plants of the Long Island Lighting Company (LILCO) is described. Each barrel of oil burned contains 0.2 pounds of vanadium oxide (V2O5), making a total of 2.75 million pounds of vanadium consumed each year. Vanadium salts and oxides in the ash exist in various forms including V+4 consumed each year. Vanadium salts and oxides in the ash exist in various forms including V+4, V+5, metavanadate (VO-3), and orthovanadate (VO4-3) but when combined in furnace wash water, all forms tend to oxidize to the +5 state which is extremely water soluble. Original recovery efforts involved lime treatment, solids separation, and carbon removal in a fluidized bed combustor; however, in 1975, laboratory studies

were begun to determine optimum recovery methods. These tests indicated that treatment with ferrous sulfate (FeSO4) to reduce V+5 to ferrous vanadate (Fe(VO3)2) and subsequent pH adjustment to 9.5 with lime was an efficient method. Pilot plant studies confirmed this finding and determined more precise operating conditions. Now full scale treatment facilities are being constructed for two power stations of LILCO burning the high vanadium content oil at a cost of \$11 million. On completion in late 1979, the additional anual income from sales of the recovered vanadium is expected to be \$700,000. The filter cake to be produced will contain an iron-to-vanadium ratio of produced will contain an iron-to-vanadium ratio of 0.25 to 0.30, and studies are underway on direct 0.25 to 0.30, and studies are underway on direct conversion to ferrovanadate (FeV) using reduction in plasma are furnace. Potential for sales of FeV are estimated at 56 million a year. (See also W79-00342) (Majtenyi-IPA)

DEWATERING OF SLUDGES FROM OIL FRIED ELECTRIC POWER GENERATING PLANTS,

Enviro Development Co., Inc., Mountain View,

M. M. Zuckerman, and R. V. Peltier.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1646-0178 (\$0.75). In: Water-1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 149-157, 1978, 2 fig, 7 tab.

Descriptors: "Waste water treatment, "Sludge, "Chemical precipitation, "Power plants, Industrial wastes, Sludge disposal, Vacuum filtration, Filter press, Dewatering, Lime, Caustic, Cost analysis, Pilot plants, Cost-benefit analysis, Laboratory tests, Electric power industry, Copper, Iron.

The results of laboratory and pilot plant studies on sludges generated by oil-fired electric power generating plants are discussed as a guide to selecting a chemical precipitant for pollutant removal. The goal in treating waste water streams is to produce as low a volume of sludge as possible. In waste streams containing copper and iron, these metals are removed by chemical precipita-tion involving pH elevation using either caustic (sodium hydroxide) or lime (calcium oxide). Five considerations for choice of precipitant are considerations for choice of precipitant are discussed: chemical costs; storage, handling, and feed; quantity of sludge produced; size of waste water treatment equipment; and sludge dewatering ability. Although dry weights of copper and iron in sludge are approximately the same for either caustic or lime treatment, more carbonates and bicarbonates precipitate with lime than caustic, thus, more sludge is produced. However, the sludge produced by lime has the advantage of being more readily dewatered. Based on empirical data, vacuum filters and filter oress are the two data, vacuum filters and filter press are the two processes for dewatering lime and caustic sludges deemed cost effective. Conditions favoring choice of which method to use are described. For examof which method to use are described. For example, high proportions of chemical cleaning solutions favor filter press dewatering but large amounts of fly ash favor vacuum filtration. (See also W79-00342) (Majtenyi-IPA) W79-00360

PRETREATMENT LAND APPLICATION OF TEXTILE PLANT WASTES, North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. For primary bibliographic entry see Field 5E. W79-00362

NEW DEVELOPMENTS IN OIL INTERCEP-

NEW DEVELOPMENTS IN OIL INTERCEPTION BY FILTRATION,
Hydrotechnic Corp., New York.
R. Nebolsine, and A. H. Danzberger.
Available from Copyright Clearance Center, Inc.,
New York, NY as 0065-8812-78-9205-0178 (\$0.95)
In: Water-1977, AICHE Symposium Series, Vol.

Group 5D—Waste Treatment Processes

74, No. 178, edited by G. F. Bennett, p 187-196, 1978, 5 fig. 4 tab.

Descriptors: *Waste water treatment, *Industrial waste, *Oily waste, *Filtration, *Multimedia deep bed filtration(MMDB), Alum, Ferric chloride Coagulation, Costs, Separation techniques Coagulation, Costs, Separa Suspended solids, Oil industry.

Use of multimedia deep bed filration (MMDB) technology is described for both secondary and tertiary treatment of oily waste waters of the petroleum industry. The process consists of removing suspended solids by straining through a deep filter bed of anthracite and sand. It was found that applying and mixing the right combinations of chemicals and/or polymetrs immediately ahead of the filter resulted in up to 90% removal of suspended solids. A typical MMDB operates at flux rates between 10-16 gpm/sf and uses a 3-5 ft bed of anthracite over a 2-3 ft bed of sand supported by I ft of gravel. Contact coagulation takes place within the bed when chemicals, such as ferric chloride and alum are added. There are a wide variety of applications for MMDB in treating oily waste waters from refineries, oil terminals, and oil fields, including; drainage and storm runoff water, ballast water, brines prior to injection into an oil field, and sea water, to condition it for injection into oil bearing formations. Capital costs of MMDB filters are discussed for plants in the 2.5 to 50 mgd range. Total costs of operation are covered, including energy, land area requirements, and chemical costs. (See also W79-00342) (Majtenyi-IPA) W79-00364

CONTROL SYSTEMS USING CARBON DIOXIDE.

Airco Industrial Gases Div., Murray Hill, NJ

R. M. Casciano. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9490-0178 (\$0.75). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 197-203, 1978, 7 fig. 2 ref.

Descriptors: *Waste water treatment, *Hydrogen ion concentration, *Carbon dioxide, Neutraliza-tion, Acid effluents, Sodium hydroxide, Thiems equation, Acid-ba fluents, Equations. Acid-base equilibrium, Alkaline ef-

Carbon dioxide (CO2) can effectively replace sulfuric acid (H2SO4) for acidifying alkaline effluents. Using CO2 is very efficient for lowering pH to 8.0 but inefficient below pH 8.0 because of the buffering effect of bicarbonates formed during treatment. Alkaline effluents can be treated directly with CO2 but acidic effluents are candidates for using CO2 also, if they are first made alkaline by adding sodium hydroxide. Then pH can be adjusted accurately using CO2. The simplest method of CO2 addition is to introduce the gas through an open-end standpipe at the bottom of the tank, a perforated pipe, or a perforated plate at the bottom of the tank. Theoretical CO2 consumption is discussed using equilibrium equations both above and below pH 8. Examples illustrating calculations are included. (See also W79-00342) (Majtenyi-IPA)

SOLVENT EXTRACTION FOR TREATMENT OF WASTEWATERS FROM ACETIC-ACID

OF WASTEWATERS FROM ACETIC-ACID MANUFACTURE, California Univ., Berkeley. N. L. Ricker, and C. J. King. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9624-0178 (\$1.75). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 204-209, 1978, 3 tab, 14 ref.

Descriptors: *Waste water treatment, *Solvent extraction, *Acetic acid, Industrial wastes, Costs,

Cost effectiveness, Recycling, Waste water, Pollutant identification, Solvents, Organic chemicals, Chemical oxygen demand(COD).

Waste waters from acetic acid plants can be treated successfully using the solvent extraction system; however, before determining what solvent or solvents to use, the composition of waste water must be examined to detect major pollutants.
Commonly, these consist of formic and acetic acids, low molecular weight alcohols and al-dehydes and have chemical oxygen demand between 5800 and 27,000. Once composition is known, the solvent can be chosen based on such criteria as: distribution coefficient for solutes to be removed, reactivity, ease of separability, low aqueous solubility, density, viscosity, and cost. Special problems are encountered with wastes containing organic acids and chlorinated acetaldehydes either because of complex formation or separation difficulties. Some promising solvents are discussed including 2-ethylhexanol and 50% cyclohexanone 50% 2-ethyl hexanol. In general costs of extraction are high compared with biological oxidation processes but on the basis of recovered acetic acid, the solvent extraction process can be economical. (See also W79-00342) (Majtenyi-IPA) W79-00366

MOLECULAR FRACTIONATION BY STAGED ULTRAFILTRATION,

Millipore Corp., Bedford, MA. Tutunjian, and A. R. Reti. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9143-0178 (\$0.95). In: Water-1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 210-216. 1978, 9 fig, 1 tab.

Descriptors: *Filtration, *Membrane processes, *Waste water purification, *Molecular fractionation, Mathematical models, Waste water, Staged ultrafiltration, Separation techniques, Water treat-

Ultrafiltration is a process which separates substances on the basis of their molecular size using membranes. It can be applied to industrial processes, such as virus control, cheese whey purification, colloid removal, and water treatment. The separation potential for a single membrane is such that it allows free passage only to substances which are 1/5 to 1/10 of the molelcular weight of the substances which it retains. Thus, good separa-tion of molecules is impossible with one membrane. However, using several membranes staged in cascade fashion, separation of molecules having very similar sizes is possible. Using mathematical model techniques, a general solution was derived. It was demonstrated that, as the number of stages is increased, relative separation is increased. Experiments were carried out to examine some of the theoretical predictions and good correlation was observed. (See also W79-00342) (Majtenyi-IPA) W79-00367

PRETREATMENT OF INDUSTRIAL WASTES WITH OZONE,

Gulf South Research Inst., New Orleans, LA. F. H. Yocum, J. H. Mayes, and W. A. Myers. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9113-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 217-227, 1978, 12 fig, 7 tab, 12 ref.

Descriptors: *Waste water treatment, *Ozone, *Industrial wastes, *Oxidation, Mathematical models, Hydrogen ion concentration, Chemical reactions, Total organic carbon, Styrene, Ethylene glycol, Ethylene diamine, Toluene diisocyanate, Chlorine, Chlorides, Water pollution treatment, Biodegradation, Chemical industry.

Ozonation for treatment of biorefractory or hard to oxidize compounds was investigated and found to be effective. The experimental procedure in-volved a stirred tank reactor and ozone was fed continuously at a rate of 11.5 l/m into a constant volume of waste water. An average test continued for 3 hours and samples were analyzed for total organic carbon (TOC). Also, mass transfer tests were done to evaluate the reactor characteristics and to correlate volumetric mass transfer coefficient with power input and gas velocity. A mathematical model was developed to evaluate the volumetric mass transfer coefficient for ozone transfer into distilled water. Also, experiments were carried out at various temperatures and pH values using four types of industrial waste waters: (1) waste from toluene diisocyanate process, con-taminated with toluene, amines, and toluene diamine; (2) waste from an ethylene glycol plant, containing ethyl glycol and other polyol com-pounds; (3) styrene process waste water, contain-ing styrene monomer; and (4) waste from an ethylene diamine plant with high chloride and residual chlorine content. Results indicate that ozonation improved biodegradability of all four wastes. Also, oxidation was increased at pill values above 10 except for the toluene waste. Cost of ozonation is admittedly prohibitive for most requirements but may be acceptible if standards are made more stringent. (See also W79-00342)

NEW TECHNOLOGY: OZONE/UV CHEMICAL OXIDATION WASTEWATER PROCESS FOR METAL COMPLEXES, ORGANIC SPECIES AND DISINFECTION,

Houston Research, Inc., TX.
H. W. Prengle, Jr., and C. E. Mauk. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9110-0178 (\$1.45). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 228-244, 1978, 15 fig. 7 tab, 9 ref.

Descriptors: *Waste water treatment, *Ozone, *Ultraviolet radiation, *Disinfection, Inorganic compounds, Organic compounds, Metals, Oxidation, Refractory compounds, Waste water purificulty of the restrict of the property o cation, Water pollution treatment, Total organic carbon(TOC), Refractivity, Gas chromatography.

Chemical oxidation of waste water using ozone can be augmented by ultraviolet (UV) light treatment. The combined ozone-UV process, known ment. The commend ozone-UV process, know commercially as oxyphotolysis, was developed for use on organic and inorganic materials as well at for disinfection. Before actual studies were began reactivity of refractory species were characterized using a refractory index, UV spectrograms, and molecular structure analysis. Oxidation rate sudies were carried out on over 30 pure compounds and 15 composite industrial wastes and reactions and 15 composite industrial wastes and reactions were followed using gas chromatography, total or ganic carbon (TOC) analysis, and pH measurements to follow destruction of organic acids Sulfate and phosphate analyses were used to investigate fate of sulfur and phosphorus, and tubering the substitute of the substitute bimetric chloride analysis was done to determine whether chlorine went to chloride or some other form. It was concluded that oxyphotolysis is effective for destruction of toxic or biorefractory pollutants. Metallic cyanides were destroyed comp ly, even the extremely stable iron cyanides. Reactivity and reaction rates correlated directly with UV absorption data; aromatic compounds absorb more UV than aliphatics and are more reactive. Reactions are driven to completion by UV energy input and the appropriate amount and frequency Oxyphotosis proved more effective for disinfer tion than either ozone or UV separately and the amount of ozone required is only 10% of the dosage needed when ozone is used alone. (See also W79-00342) (Majtenyi-IPA)

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DESTRUCTION OF TRACE TOXIC COM-POUNDS IN WATER AND SLUDGE BY IONIZ-ING RADIATION, Massachusetts Inst. of Tech. Cambridge. E. W. Merrill, D. R. Mabry, R. B. Schulz, W. D. Coleman, and J. G. Trump. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9446-0174 (80.75). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 245-250, 1978. 9 fig, 2 tab, 4 ref.

Descriptors: "Toxicity, "Waste water treatment, "Ionizing radiation, "Polychlorinated biphenyls, Studge treatment, Studge, Industrial wastes, Herbicides, Water pollution, Organic compounds, High pressure liquid chromatography(HPLC), Ultraviolet radiation.

Traces of toxic compounds, such as the herbicide monuron and two polychlorinated biphenyls (PCBs), 3,4,2-trichlorobiphenyl and 4 chlorobiphenyl, were successfully destroyed by ionizing radiation. Samples were irradiated using a 3 million electron volt Van de Graaff generator 3 million electron voit van de Graaff generator and results were analyzed using high pressure liquid chromatography (HPLC) and ultraviolet (UV) spectra. Using simple aqueous solutions of monuron, over 96% of the LC peak disappeared after a radiation dose of 10 kilorads. To simulate actual sludge conditions, the PCBs were dissolved in soap solutions and extracted with hexane before irradiation. Results were followed using HPLC and, as with monuron, destruction was rapid as shown by disappearance of the peak correspond-ing to the parent PCB. In addition, the appearance of degradation peaks earlier in the chromatogram indicated the creation of substances more soluble than the parent compound, probably hydroxylated compounds. It is hypothesized that, in water, hydroxyl radical attack on the PCB and monuron is the principal mode of degradation and that doses of 10 kilorads would remove most of such contaminants. (See also W79-00342) (Majtenyi-IPA)

CHARACTERIZATION OF PERFORMANCE OF FULL-SCALE TERTIARY WASTEWATER GRANULAR MEDIA FILTERS, Northwestern Univ., Evanston, IL. J. A. FitzPatrick, and C. L. Swanson.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1089-0178 (\$1.15). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 251-264, 1978, 13 fig, 4 tab, 8 ref.

Descriptors: *Waste water treatment, *Filtration, *Municipal wastes, *Tertiary treatment, *Sewage, Mathematical models, Suspended solids, Turbidity, Biological oxygen demand(BOD), Chicago Granular media filters, Flocculation, Particle size, Evaluation, Sampling.

Evaluation studies were carried out on 8 small ter-tiary granular filtration plants in the Chicago area. Performance on such filters depends on such vari-ables as media type, size, and depth, filtration rate, influent suspended solid concentration, in-fluent particle size distribution, type of secondary process, and flocculation characteristics of solids. The study began by characterizing performance as a function of design and operational variables. Sampling was done at 24-hr intervals, with some shorter periods, and routinely analyzed for typidi-Sampling was done at 24-hr intervals, with some shorter periods, and routinely analyzed for turbidity, suspended solids and biological oxygen demand (BOD). Based on the empirical data collected, a mathematical model was developed for filtration performance and tested against actual plant achievements. It was concluded that: total suspended solid removal efficiency is very strengly desendent or solid removal efficiency is very strengly desendent or solid removal. strongly dependent on refiltration parameters; and if straining is the dominant particle collection mode, suspended solid removal efficiency is weakly dependent on filter media size and depth. (See also W79-00342) (Majtenyi-IPA) W79-00371

ON-SITE GENERATION OF HYPOCHLORITE SOLUTIONS BY ELECTROLYSIS OF SEA-

WATER, Diamond Shamrock Corp., Painesville, OH. For primary bibliographic entry see Field 5F. W79-00372

WASTEWATER ODOR PROBLEM SOLVING --PROCESS MODIFICATION VERSUS AIR TREATMENT,
Research Corp. of New England. Wethersfield.

R. E. Kenson, V. G. Boscak, and G. T. Brookman. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1647-0178 (\$0.85). In: Water--1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 270-277, 1978, 5 fig, 3 tab, 7 ref.

Descriptors: "Odor, "Waste water treatment, "Air pollution, "Contamination(Air), Costs, Cost-benefit analysis, Pollutant identification, Evalua-

Process modification is compared with air treat-ment as a preferred method of solving waste water odor problems. It is concluded that both methods can be cost effective if all the costs, both capital and operational, are considered, and all techni-cally feasible solutions are examined before implementation. The following plan is recommended for solving such odor problems: (1) evaluation of odor emissions from both stack and open sources and their impact on ambient odors; (2) an engineering evaluation of alternate solutions including energy availability and costs; (3) design and construction of the chosen solution after review of each feasi-ble control pros/cons. Some of the engineering measurements and evaluation are illustrated by specific examples including case histories of how odor problems were solved. (See also W79-00342) (Majtenyi-IPA) W79-00373

CONTROL OF NUISANCE ODORS FROM PONDS BY THE USE OF BACTERIA CUL-

Rohm and Haas Kentucky Inc., Louisville, KY. R. A. Jensen.

K. A. Jensen. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9093-0178 (\$0.75). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 278-282,

Descriptors: *Odor, *Waste water treatment, *Air pollution, *Biological treatment, *Bacteria, *Sulfur bacteria, Anaerobic bacteria, Formal-dehyde, Dissolved oxygen, Contamination(Air), Stagnant water, Bacterial culture.

Bacterial cultures can be used to eliminate offensive odors generated by sulfur-reducing anaerobic bacteria in stagnant ponds. The development of a successful bacterial treatment is traced over a three-year period during which experiments were carried out at an odor-producing landfill basin con-taining water in Louisville, Kentucky. A number of methods were applied without success, includ-ing; aeration, formaldehyde as a bactericide, and hydrogen peroxide to increase dissolved oxygen.

The successful bacterial culture method took advantage of the favorable neutral pH and long residence time. The odor-producing area was in-noculated with 'DEC Plus' dried bacterial culture at a dosage of 1 lb per 100,000 to 200,000 lbs water Even though the temperature was below the op-timum performance temperature for the bacteria timum performance temperature for the bacteria, it was thought that this culture was capable of overriding the sulfide-producing bacteria and converting the biological action into an odorless mode. This proved to be true and, later, it was established that increasing the frequency of bacteria addition to six times, day reduces the oscil teria addition to six times a day reduces the possi-bility of the broth losing strength before use. The most effective method is to distribute active broth over the full surface of the pond. (See also W79-00342) (Majtenyi-IPA) W79-00374

FACTORS INFLUENCING INDUCED AIR FLOTATION, Petrolite Corp., St. Louis, MO. C. W. Burkhardt, J. V. Janes, III, and D. W.

Griffiths.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1068-0178 (\$0.75). In: Water-1977, AIChE Symposium Series, Vol 74, No 178. edited by G. F. Bennett, p 283-289, 1978, 5 fig, 3 tab, 10 ref.

Descriptors: *Waste water treatment, *Flotation, *Oily wastes, *Polyelectrolytes, *Ionization, Industrial wastes, Reaction rate constants, Froth flotation. Waste identification, Oil-water interfaces, Oily water.

The use of materials, such as hydrolyzing metal salts and cationic polyelectrolytes, was shown to produce up to 40-fold acceleration of the induced air flotation process for clarifying oily wastes. Assuming that a flotation aid must first interact with individual oil droplets, the research approach was to relate performance of a flotation aid to its affinity for the oil/water interface. Experiments were done to investigate the influence of ionic strength on solution properties and performance as air flotation aids of two cationic polyelectrolytes, Polymer C-76 and Polymer C-20. Electrolyte pro-perties were determined and their performance as flotation aids was measured. Studies using emulsions of crude oil and water showed that clarifica-tion followed first order kinetics. However, in the presence of polyelectrolytes, the first order rate constant was found to be a function of polyelectrolyte concentration. Complete performance profiles were developed for each polyelectrolyte at 6 concentrations ranging from 1-5 mg/l. The data confirmed that clarification rate is accelerated by polyelectrolytes and performance improves as ionic strength increases. It is concluded that it may be reasonable to consider natural ion strength before choosing an appropriate flotation process. (See also W79-00342) (Majtenyi-IPA) W79-00375

CRITICAL ANALYSIS OF FLOTATION PER-FORMANCE, Petrolite Corp., St. Louis, MO. Tetrolite Div. R. J. Churschill, and K. J. Tacchi.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1067-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 290-299, 1978, 9 fig, 2 tab.

Descriptors: *Froth flotation, *Waste water treat-ment, *Flotation, *Comparative benefits, Industri-al wastes, Dissolved gas flotation, Induced gas flotation, Water treatment, Performance, Evalua-

Because air flotation is so widely applied and often is the only water treatment method used, an examination of the factors which affect process selection and performance was made. The two major methods currently in use, dissolved gas and induced gas, are described and some advantages of each are noted. Factors influencing flotation performance are identified as: (1) adhesion of bubbles in a coagule or floe structure as the bubble rises; and (3) adsorption of bubbles into a coagule of floc as it forms. Considering these factors and the surface chemistry aspect of flotation, criteria for performance evaluation can be established. The dissolved gas and induced gas methods are discussed on this basis and some theoretical factors to be considered in designing such systems are described. Four specific examples using operating data from full scale flotation systems demonstrate that situations exist in which either process is ap-

Group 5D—Waste Treatment Processes

plicable and will perform acceptably. (See also W79-00342) (Majtenyi-IPA)

SORPTION CAPABILITIES OF VARIOU MATERIALS FOR LEACHATE TREATMENT, New Jersey Inst. of Tech., Newark.

P. Chan, J. Liskowitz, A. J. Perna, M. Sheih, and R. Trattner.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9557-0178 (\$1.15). In: Water-1977, AICHE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 300-308, 1978, 4 fig, 6 tab, 6 ref.

Descriptors: *Waste water treatment, *Leachates, Scorption, Sludge, Industrial waste, Lysimeter, Fly ash, Activated carbon, Zeolite, Kaolinite, Hydrogen ion concentration, Water treatment, Metals, Performance, Evaluation, Total organic carbon, Chemical oxygen demand, Landfills.

To evaluate performance of natural and synthetic sorbents for removing components present in leachates from industrial sludge landfills, a series of lysimeter experiments was carried out. The sor-bents investigated included: basic and acidic fly sash, bottom ash, Ottawa sand, activated carbon, allite, kaolinite, vermiculite, natural zeolite, cullite, and three sizes of activated alumina. The moisture content of the sludge was assessed to determine how much water should be mixed with a particular sludge to attain maximum concentration of pollutants. Then, concentrations of sludge in distilled water were prepared to give a ratio of 2.5 ml water per gram of dried sludge. The mixtures were stirred 24 hrs, filtered, and used for lystimeter studies. Parameters chosen to evaluate performance were: pH, conduction, chemical oxygen demand (COD), and total organic carbon (TOC). Leachates from three types of industrial sludge were tested using the sorbents listed. Results in-dicated that no single sorbent could remove all objectionable ions from the leachates studied, but a number of them exhibited removal capacity and retainability under dynamic conditions. A variety of specialized capabilities were noted. In general, the behavior of a sorbent, as regards removal of a particular contaminant, varies with the type of particular contaminant, varies with the type of leachate being treated. Also, pH of the leachate is one of the prime factors in determining the effectiveness of the system. (See also W79-00342) (Majtenyi-IPA) W79-00377

REMOVAL OF FLUOBORATE FROM PLAT-ING WASTE MECAHNISM. WASTEWATER: TECHNIQUE

New Jersey Inst. of Tech., Newark.

V. N. Cagnati, R. H. Haralson, T. A. Hunter, J. W. Liskowitz, and A. J. Perna.

LISKOWIZ, and A. J. Perna. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1648-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 309-315, 1978, 5 fig, 2 tab, 10 ref.

Descriptors: *Waste water treatment, *Flotation, *Ion flotation, *Fluoborate, Chemical reactions, Physical reactions, Surfactants, Foaming, Electrochemistry, Industrial wastes.

A technique for removal of fluoborate ion from waste waters of the electroplating industry is described and a reaction mechanism explained. Fluoborate, which is being substituted for other toxic ions in electroplating, is a tightly bound tetrahedral of four fluoride atoms symmetrically surrounding a centrally located boron atom. The diameter of this ion is only about 5A and this small size in addition to its symmetrical shape makes it more like an ionized single atom than a molecular ion. The removal process, called ion flotation, is a combination chemical-physical process in which a surfactant is added to the solution and the contaminant is foamed out of binding it so that it will

be held when the surfactant is removed. A number of cationic surfactants were tested and found acceptable but two were chosen for use in actual flotation experiments, Armac-C (a 12-carbon Coco amine acetate) and Armac-T. Results indicated a maximum of 94% removal of fluoborate by Armax-T at the molar ratio of 3:5:1. Armac-C gave Armac-1 at the motar ratio of 3:5:1. Armac-C gave slightly lower removal percentages. The increase in removal capacity of Armac-T over Armac-C is attributed to the longer carbon chain of 18 atoms. The mechanism involves replacement of the acetate on the active site of the surfactant by fluoborate. (See also W79-00342) (Majtenyi-IPA)

RURAL WATER SUPPLIES FROM LATERITE

RUNOFF, Nigeria Univ., Nsukka. Dept. of Civil Engineering. For primary bibliographic entry see Field SF. W79-00387

PROCESS FOR PURIFYING AQUEOUS INDUS-TRIAL EFFLUENTS. CIBA-FEIGY Ltd.,

Basel (Switzerland). (Assignee). British Patent No 1,499,387. February 1, 1978. 15 p. 40 claims, 2 tab

Descriptors: *Adsorption, *Bleaching wastes, *Color, *Waste water treatment, *Patents, Textiles, Wastes, Industrial wastes, Pulp wastes, Water pollution sources, Water pollution treatment, Waste treatment, Pulp and paper industry, Effluents, Water purification, Clays, Magnesium compounds, Decoloring, Adsorbents.

A process is provided for purifying industrial ef-A process is provided for purifying industrial ef-fluents, particularly for decolorizing waste waters from the paper or textile industries. The process involves bringing the effluent into contact with an adsorbent prepared by precipitating a basic nitrogenous polymeric compound onto a carrier with an activated clay mineral. For example, the adsorbent can be prepared by using activated mag-nesium bentonite to precipitate a bentonite to precipitate polyamidepolyamine (derived from polymerized linoleic acid/linolenic acid and triethylenetetramine) onto bleached pine sulfite cellulose as the carrier. (Lynch-IPC) W79-00399

WATER REUSE: A TRICKLE BECOMES A For primary bibliographic entry see Field 3E. W79-00400

USE OF HYDROLYSIS LIGNIN FOR PURIFI-CATION OF EFFLUENTS FROM AMMONIA PRODUCTION AND THE PREPARATION OF COMPLEX FERTILIZERS (PRIMENENE GIDROLIZNOGO LIGNINA DLYA OCHISTKI STOCHNYKH VOD AMMIACHNOGO PROIZ-VODSTVA I POLUCHENIYA SLOZHNYKH UDOBRENID.

V. I. Meerovskaya, B. G. Ostrobrod, A. E. Kuznetsova, N. U. Rizaev, and S. A. Nerozin Doklady Akademii Nauk Uzbekskoi SSR, No. 4, p 46-47 1977. 2 tab.

Descriptors: *Lignins, *Fertilizers, *Waste water treatment, *Ammonia, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Nutrients, Trace elements, Nitrogen compounds, Water pollution sources, Effluents, Cotton, Hydrolysis, Copper, Solid wastes, Byproducts, Pulls wastes.

The removal of carbon oxides during the production of ammonia with copper-ammonia solutions results in the accumulation of 5-20% ammonia, 0.1-0.2% acetic acid in the effluents. A laboratory method was developed for treating copper-ammonia solutions with hydrolysis ligain in a

62

solid/liquid ratio of 1:2 to 1:4. The product is then dried. Solutions treated in this fashion are completely free of copper. In addition, the product contains 99% organic material enriched with ammonium nitrogen and 0.1% copper, which is an important nutritional trace element. This material is used for producing a complex soil amendment for cotton plantations by additions of double superphosphate, urea, and urea-formaldehyde fertilizer. (Chern-IPC)

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BIOLOGICALLY ACTIVE SUBSTANCES IN PULPING WASTE LIQUORS. 1. SUBSTANCES PULPING WASTE LIQUORS. I. SUBSTANCES ACTIVE AGAINST TERMITES, COPTOTERMES FORMOSANUS SHIRAKI, IN KRAFT PULPING AND BLEACHING WASTES, Kochi Univ. (Japan).
K. Sameshima, N. Takamura, and E. Kamino.
Journal of the Japan Wood Research Society (Mokuzai Gakkaishi), Vol. 24, No. 1, p 65-70, January, 1978. 5 fig. 16 ref. 2 tab.

Descriptors: *Pulp wastes, *Bleaching wastes, *Insects, *Water pollution effects, Wastes, Industrial wastes, Pulp and paper industry, Water pollution sources, Pine trees, Birch trees, Waste water treatment, Neutralization, Lime, Activated sludge, Water pollution treatment, Toxicity, Detoxification, Dialysis, Solvent extractions, Ion Detoxincation, Daisyss, Sveten extractions, ton exchange, Ultraviolet radiation, Inorganic com-pounds, Salts, Sodium compounds, Sodium chloride, Sodium carbonate, Termites, Aluminum sulfate, Kraft pulping, Wood extractives, Insecti-

Filter-paper disks were impregnated with laboratory kraft pulping and bleaching wastes from Pinus densiflora or Betula platyphylla, dried overnight at room temperature (20-30C), and placed in petitishes along with termites (50 workers plus 5 soldiers per dish). Termite mortality was determined at 24-hr intervals during incubation in the dark at 30C. All the wastes were toyic to the termites. 30C. All the wastes were toxic to the termites.
Four conventional effluent treatments
(neutralization, alum, lime, and activated sludge
process) failed to remove the toxicity from the pine kraft pulping waste. Resuls of termite expo-sure tests after dialysis, solvent extraction, ion-exchange, and ultraviolet irradiation suggested exchange, and ultraviolet irradiation suggested that the main active substances in the bleaching wastes (except the chlorination stage) also ap-peared to be inorganic salts, notably sodium car-bonate, sulfate, and chloride. This confirms the value of the ancient practice of wood protection by salt impregnation and the important effects of salts in seawater on marine organisms. (Brown-IDC) IPC) W79-00404

INVESTIGATION OF FACTORS AFFECTING BOD MEASUREMENT AND EXPERIENCE WITH THE 1-DAY BOD TEST, National Council of Paper Industry for Air and Stream Improvement, Inc., New York. For primary bibliographic entry see Field 5A. W79-00405

STEAM STRIPPING REDUCES CONDENSATE AT WEYCO MILL, Weyerhaeuser Co., Springfield, OR

For primary bibliographic entry see Field 3E. W79-00409 ON THE REMOVAL OF LIGNOSULFONATES AND CARBOHYDRATES FROM SULFITE PULP WASH WATERS WITH ACTIVATED CARBON (ZUR ENTFERNUNG VON LIGNIN-

SULFONATEN UND KOHLENHYDRATEN AUS SULFITZELLSTOFF-WASCHWAESSERN MIT-

TELS AKTVKOHLE),
Technische Hochschule, Darmstadt (West Germany). Inst fuer Makromolekulare Chemie.
M. Gahin, and T. Krause.

Das Papier, Vol. 32, No. 3, p 97-101, March, 1978. 5 fig, 2 illus, 9 ref, 1 tab. English summary.

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Descriptors: *Bleaching wastes, *Waste water treatment, *Activated carbon, Wastes, Industrial treatment, "Activated carbon, Wastes, Industrial wastes, Water pollution sources, Water pollution treatment, Pulp and paper industry, Pulp wastes, Lignins, Sulfonates, Effluents, Filtration, Filters, Organic compounds, Carbohydrates, Chromatography, Inorganic compounds, Beech trees(Fagus), Sulfite pulp, Lignosulfonates.

The effluent from the last washing stage of an unbleached beech sulfite pulp was filtered through granulated activated carbon. The filtrates and the untreated effluent were analyzed for lignosulfonates, carbohydrates, and inorganic constituents. Molecular weight distribution of the lignosulfonates was determined by molecular sieve chromatography. Filtration on activated carbon is shown to reduce the solids content of such wash water to about 40% of the original value and to remove practically all lignosulfonates and carbohydrates. (Ward-IPC) W79-00410

PROCESS DESIGN INVESTIGATIONS FOR ALASKA PULP MILL WASTEWATER TREAT-MENT FACILITIES, Edde (Howard), Inc., Bellevue, WA. H. Edde, R. French, O. Mason, and T. Hosoi. Progress in Water Technology, Vol. 9, No. 3, p 599-609, 1977. 6 fig, 4 ref, 4 tab.

Descriptors: "Pulp wastes, "Waste water treatment, "Biological treatment, Wastes, Industrial wastes, Waste treatment, Water pollution sources, Water pollution treatment, Pulp and paper industry, Alaska, Air, Oxygen, Activated sludge, Bleaching, wastes, Nutrients, Microorganisms, Biochemical oxygen demand, Sludge, Pilot plants, Dissolving pulp mills, Sulfite pulp mills.

The operation of air-activated and high-purity oxygen-activated biological effluent treatment pilot plants were compared in an investigation conducted by the Alaska Lumber and Pulp Co. Inc. (Sitka, Alaska), EKONO Inc., and Howard Edde Inc., Consultant Engineers (Washington). The performance of the UNOX activated sludge treatment system was superior to that of the air-activated system was superior to that of the air-activated system for treating the magnesium-base sulfite dissolving-pulp mill's effluent. When treatment of the chlorination-stage effluent from the bleach plant was bypassed, the recommended oxygen-aeration was bypassed, the recommended oxygen-aeration tank process design loading was a food/microorganism ratio of 1.0 as compared with 0.6 for air-activated sludge while obtaning high 5-day BOD removal. Similarly, the oxygen system had an allowable clarifier process design mass loading of 44 lb/sq ft/day and 4% underflow solids consistency compared with 30 lb/sq ft/day and 1%, respectively, for the air-activated sludge. Also, the oxygen system exhibited greater process stability during shock loading and following startup after extended mill shutdowns. The effluent from both the air-activated sludge and UNOX system satisfied the bioassay for LC(20) and LC(50). The fuel value of the excess biological sludge from either pilot plant was about 9,400 BTU/lb (ovendry basis). (Swichtenberg-IPC)

EPA'S GOAL FOR SUSPENDED SOLIDS IS NOT MET WITH MEDIA FILTRATION, Procter and Gamble Co., Cincinnati, OH. C. D. Biskner, C. A. Barton, and J. H. Millican. Pulp and Paper, Vol. 52, No. 5, p 126-128, May, 1978. 2 fig, 5 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Filtration, *Suspended solids, Wastes, Industrial wastes, Waste treatment, Water pollution reatment, Water pollution sources, Pulp and paper industry, Sands, Coals, Water purification, Filters, Effluents, Coagulation, Cations,

Polymers, Flow rates, Water pollution control, Dissolving pulp mills, Aluminum sulfate, *Water quality standards.

quality standards.

The performance of downflow and upflow dual-media filtration systems comprised of fine sand, coarse aand, anthracite coal, or combinations of these were compared in pilot plant studies conducted by Procter and Gamble Co. (Cincinnati, Ohio) and E. C. Jordan Co. (Portland, Maine) at the dissolving-pulp mill of Buckeye Cellulose Corp. near Perry, Florida. The type of filter media has little effect on the removal of total suspended solids (TSS) from the secondary (biological) treatment effluents. The addition of coagulant chemicals (viz., alum and a cationic polymer) raises the filter effluent TSS above the influent TSS level prior to coagulation. The best performance of granular media filtration that could be expected at a mill with secondary treatment effluent TSS ranging from 30 to 40 mg/liter would be 18 mg/liter (as compared to EPA's goal of 10 mg/liter) with an annual average of 20-25 mg/liter. The filters would have to be operated at a flow rate of 2 gal/min/sq ft to achieve these levels. (Swichtenberg-IPC)

ENERGY CONSUMPTION FOR ELECTRODI-ALYSIS OF SPENT SULFITE LIQUORS (ENERGOZATRATY NA ELEKTRODIALIZ OTRABOTANNOGO SHCHELOKA SUL'FITNO-TSELLYULOZNOGO PROIZVODSTVA), V. A. Kirsanov, V. A. Smirnova, and L. A.

Sbornik Trudov, Tsentralnyi Nauchno-Iss-ledovatel'skii Institut Bumagi, No. 10, p 216-220, 1975. 1 fig, 1 ref, 2 tab.

Descriptors: *Pulp wastes, *Sulfite liquors, *Waste water treatment, *Electrodialysis, *Energy, Wastes, Industrial wastes, Water pollution treatment, Electrical resistance, Water pollution control, Membrane processes, Dialysis, Separation techniques, Pulp and paper industry, Water pollution sources, Spent sulfite liquor.

In a study of the electrodialytic processing of mag nesium-base spent sulfite pulping liquors of various concentrations, the effect of the electric reous concentrations, the effect of the electric resistance of the electrodialysis cell on the energy consumption was found to increase with increasing current density, but the use of low-density current is not justified in view of the relatively high amortization rate of the equipment. A compromise between the high energy consumption of high current density and the low efficiency of the equipment at low density involves a stepwise treatment of the spent liquor, i.e., diminishing the current density in consecutive stages of the process. In this case the overall energy consumption is within acceptable limits at sufficiently high efficiency of the process. (Stapinski-IPC)

ELECTRIC RESISTANCE OF THE CATION-SELECTIVE MK-40 MEMBRANE DURING ELECTRODIALYSIS OF SPEND SULFITE LIQUOR (ELEKTROSOPROTIVLENIE KA-TIONOSELEKTIVNOY MEMBRANY MK-40 PRI ELEKTRODIALZE OTRABOTANNOGO SUL'FITNOGO SHCHELOKA), For primary bibliographic entry see Field 5A. W79-00417

CHARACTERIZATION OF SPENT BLEACHING LIQUORS. PART I. ULTRAFIL-TRATION OF EFFLUENTS FROM CONVEN-AND OXYGEN BLEACHING TIONAL AND OXYGEN BLEACHING SEQUENCES, Helsinki Univ. of Technology, Otaniemi (Finland).

Lab. of Wood Chemistry. K. Pfister, and E. Sjostrom.

63

Svensk Papperstidning, Vol. 81, No. 6, p 195-205, April 10, 1978. 9 fig. 37 ref. 6 tab.

Descriptors: "Bleaching wastes, "Pollutants, Chlorine, Hypochlorite, Chlorine dioxide, Oxygen, Alkaline extraction, Pulp wastes, Pulp and paper industry, Water pollution sources, Wastes, Industrial wastes, Organic matter, Carbon, Color, Biochemical oxygen demand, Toxicity, Pine trees, Effluents, Lime, Chemical precipitation, Waste water treatment, Waste treatment, Biological treatment, "Ultrafiltration, Oxygen bleaching, Bleaching agents, Molecular weight.

Spent liquors from laboratory bleaching of pine kraft pulp by the conventional CEH sequence were compared with effluents from oxygen (OCE and ODE) sequences. The dissolved material was fractionated by ultrafiltration (M below 1000, between 1000 and 10,000, and over 10,000) and analyzed for organic dry matter, organic carbon, permanganate-number, color, BOD, and toxicity. The main part (65-70% of the dissolved material) was found in effluents from the alkaline-extraction The main part (65-70% of the dissolved material) was found in effluents from the alkaline-extraction (E) stage of the CEH sequence and from the oxygen stage in the OCE and ODE sequences. Liquors from the C (chlorination), D (chlorination), and H (sodium hypochlorite) stages contained up to 60% low-molecular substances (M below 1000) and less than 10% high-molecular (M above 10,000) material. In contrast, 80-90% of the material which dissolved in E-stage liquors had molecular weights above 1000. Of the total color load (173 & Pt/(ton of pulp) in the CEH sequence molecular weights above 1000. Of the total color load (173 kg Pt/ton of pulp) in the CEH sequence 80% originated from alkaline extraction. Color loads from the OCE and ODE sequences were 34 and 8 kg Pt/ton, respectively, assuming 100% recovery of oxygen-stage liquors. Most of the color for all spent liquors derived from the M fraction above 1000. The 7-day BOD of the CEH effect were about 11 kg extraction and the stage of the total stage of the color for the total stage of the total tion above 1000. The 7-day BOD of the CEH effluent was about 12 kg oxygen/ton of pulp, to which the C-stage contributed 50%, the E-stage 40%, and the H-stage 10%. The 7-day BOD loads of the CE and DE stages following an oxygen stage were 5 and 3.5 kg oxygen/ton, respectively. Most of the BOD in the C, H, and O-stage liquors came from the low molecular (M below 1000) fractions, whereas high-molecular material contributed more than half of the BOD load in the E and D-stage effluents. The C-stage liquors contained by far the most toxic substances. Possible purification of spent bleach liquors by ultrafitration, lime precipitation, and biological treatment are also discussed. (Brown-IPC) W79-00419

THE CLOSED MILL CONCEPT, International Paper Co., Mobile, AL. For primary bibliographic entry see Field 3E. W79-00420

CLARIFIER WITH SUSPENDED LAYER OF SEDIMENT (OSVETLITEL' SO VZVESHEN-NYM SLOEM OSADKA), Ogrskaya Karonnaya Fabrika, latvia SSR. R. A. Kudryashova.

Tsellyuloza Bumaga i Karton Referativnaya Infor-matsiya, No. 35, p 6, December, 1977. 1 fig.

Descriptors: *Pulp wastes, *Waste water treat-ment, *Clarifiers, Water conservation, Industrial water, Wastes, Industrial wastes, Waste treat-ment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Suspended solids, Biochemical oxygen demand, Effluents, Kaolin, Fibers(Papermaking), Board mills.

A continuous clarifier is described for removing suspended solids from paperboard manufacturing effluents. The clarifier is composed of a metal-finished cone with a 5 m diameter, 7.8 m high cylinder reservoir which is divided into central distributing, suspended sediment, clean water, and settled sediment sections. Throughput of the clarifier is 90-110 cu m/hr. Operating temperature is 8-22C at atmospheric pressure. Effluent retention

Group 5D-Waste Treatment Processes

time in the suspended sediment and clean water sections was 20-30 and 20 min, respectively. The suspended solids content in the effluent was reduced from 400 to 10-20 mg/liter. Fiber and kaolin removal was 96-98%; 5-day BOD was reduced 63%. With this system 6-70% purified water instead of fresh water can be used in board manufacture. (DuVall-IPC)

DEVELOPMENT OF AN EFFLUENT-FREE SULFITE PULP MILL (ENTWICKLUNG ZUR ABWASSERFREI ARBEITENDEN SULFITZELLSTOFF-FABRIK),

R. Hornke Wochenblatt fuer Papierfabrikation, Vol 106, No 6, p 247-248, 250, March 31, 1978. 4 fig. 1 tab.

Descriptors: *Water pollution control, *Sulfite pulp mills, Pulp and paper industry, Water pollu-tion sources, Waste treatment, Water pollution treatment, Wastes, Industrial wastes, Bleaching wastes, Pulp wastes, Evaporation, Burning, Con-densates, Effluents, Sulfite liquors.

This proposal visualizes a system in which the effluents from the sulfite digestion of wood handled separately from those of the pulp bleach plant. The former which are rich in lignosulfonates are evaporated and burned, and the condensates reused. The latter which are rich in alkali and reused. The latter which are rich in alkali and chlorine compounds will require different treatments, depending on the type of bleach. While the closure of the chemical pulping system has been successful in burning 99.8% of the total organic waste liquor content, the closing of a separate bleach-plant system will require further research and development work. (Ward-IPC) W79-00424

STUDIES OF ION EXCHANGE AND CHELA-TION COMPOUNDS ADSORBED ON GRANU-LAR GRAPHITE.

West Virginia Univ., Morgantown. J. L. Hern.

Available from the National Technical Informa-Available 170m the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 179, Price codes: A04 in paper copy, A01 in microfiche, PhD Dissertation, Part One, p 1-60, 1976. 13 fig, 3 tab, 14 ref. OWRT A-030-WVA(2) (Part 1), 14-34-0001-6051

Descriptors: "Acid mine water, "Cation exchange, "Chelation, "Electrodes, "Ion exchange, "Water treatment, Adsorption, Chemical analysis, Chemical properties, Chemical reactions, Chemistry, Chromatography, Electrochemistry, Cation exchange medium, Chelation chromatography, Coke, Graphite, Metal ions.

Several compounds that have particular ion exchange or chelation properties have been adsorbed on granular graphite and coke. The resulting materials exhibit ion exchange and chelation properties similar to typical commercial exchange resins used for separations involving metal ions. However, the exchange capacities are lower (approximately 1000 times) than commercial extension particular attention has been devoted to (approximately 1000 times) than commercial materials. Particular attention has been devoted to the immobilization of several metals on Eriochrome Black-T modified graphite columns. Separation of Fe(3+) from multicomponent solutions of Fe(3+), Ni(2+), Co(2+), Mg(2+), and Ca(2+) possible by adjusting the pH of these solu-Cat(2+) possione by adjusting the period interestions. Frontial analysis chromatography has been carried out utilizing EBT-graphite packing material for regular LC and HPLC techniques. Fe(3+) and Ni(2+) can be separated by HPLC using this modified graphite. Application of an electrical potential also is an effective method of removing metal ions from the modified graphite columns.

The mechanisms of this removal is thought to be the electrochemical generation of H(+) ion. The removal of metal ions from aqueous solutions by formation of the metal hydroxides within granular electrode beds has been explored briefly. This is

carried out by producing OH(-) ion electrochemically within the electrode bed, which results in metal hydroxide precipitation. (See also W79-00432) W79-00431

CONTINUOUS ELECTROCHEMICAL SYNTHE-USING A PACKED GRANULAR ELEC-TRODE,

West Virginia Univ., Morgantown J. L. Hern.

J. L. Hern. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 180, Price codes: A05 in paper copy, A01 in microfiche. PhD Dissertation, Part Two, p 61-130, 1976. 17 fig, 3 tab, 18 ref. OWRT A-030-WVA(2) (Part 2), 14-34-0001-6051.

Descriptors: *Acid mine water,
*Electrochemistry, *Electrodes, *Synthesis,
*Water treatment, Anions, Cations, Chemical properties, Chemical reactions, Chemistry, Electrolysis, Ions, Ion exchange, Organic compounds, Con-tinuous flow cell, Electrochemical synthesis, Granular electrode, Graphite, Reaction mechanisms

An electrochemical synthesis has been studied and a continuous flow cell utilizing granular graphite or platinum dust for quantitative electrolysis has been developed. The synthesis reaction proceeds by way of electrochemical radical anion production followed by a homogeneous solution reaction. It is concluded that the electrochemical cell does function, but because of uncompensated re-sistances when used in aprotic organic solvents of low conductivity, product yields are very low for the p-iodonitrobenzene system. The anion radical the p-todonitrobenzene system. The anion radical produced for the reduction of p-todonitrobenzene has been observed by ESR and compared to the radical produced in the presence of CN(-) ion. The electrochemical reaction has also been studied by cyclic voltammetry at room temperature and 45C. A reaction mechanism for the replacement of I(-). by CN(·) has been suggested and compared to that previously reported in the literature. A qualitative discussion of the resistances encountered in the granular beds is also presented. (See also W79-00431) W79-00432

DISTRIBUTION OF HETEROTROPHIC AND NITRIFYING BACTERIA WITHIN THE AERO-BIC-MEDIA TRICKLING FILTER,

West Virginia Univ., Morgantown G. W. Gillespie.

Available from the National Technical Informa Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 175, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, 1977. 90 p, 6 fig, 32 tab, 27 append. OWRT A-036-WVA(1), 14-34-0001-7104.

Descriptors: *Aerobic treatment, *Nitrification, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Oxygen, Seconda-ry treatment, Solids contact processes, Treatment, Wastes, Waste treatment, Water pollution treat-

Distribution and densities of the heterotrophic and nitrifying bacteria within the aerobic-media trickling filter (AMTF) were evaluated for response to changing detention times and nitrogen loadings. Comparison of the total mean densities obtained during each experiment indicated that nitrification within the AMTF reactor was dependent upon the activity of the nitriging heteria and dent upon the activity of the nitrifying bacteria and not their densities. In general, increasing the de-tention time resulted in an increase of the nitrify-ing efficiency of the AMTF reactor. However, in some instances, increasing the detention time caused a reduction in the nitrification potential (nitrifying density) of the system. Comparison of the microbial densities of each site examined within the AMTF unit indicates that the

heterotrophic and nitrifying bacteria are distributed throughout the entire depth of the reactor. No population profiles to reflect the changing water quality were observed.

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AEROBIC MEDIA TRICKLING FILTER AP-PLIED TO NITROGEN CONTROL, West Virginia Univ., Morgantown.

P. B. Huff.
Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 140, Price codes: A07 in paper copy, A01 in microfiche. M.S. thesis, 1977. 127 p, 19 fig., 23 tab, 31 append. OWRT-A-036-WVA(2), 14-34-0001-7104.

Descriptors: *Aerobic treatment, *Nitrification, *Oxygenation, *Sewage treatment, *Trickling filters, *Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Nitrogen, Oxygen, Secondary treatment, Solids Contact Processes, Treatment, Wastes, Waste treatment, Water pollution treatment, Filtration.

This bench-scale study demonstrates the ability of the aerobic media trickling filter (AMTF) to successfully nitrify, when used as the second stage in a two stage carbon-nitrogen of aerobic slime attached to an inert media. The uniqueness of this system is the aeration provided by the media which permits the media to be submerted rather than requiring the void spaces to insure the availability of oxygen. There are 276 hollow teflon tube which comprise the media. Each one has a 0.762 than requiring the void spaces to insure the availability of oxygen. There are 276 hollow teflon tubes which comprise the media. Each one has a 0.762 mm diameter and is bonded into a pressurized oxygen manifold at the top of the unit. These tubings hang the entire 196.0 cm of the vertical 39.0 mm diameter pipe which flows full of wastewater. Diffusion of oxygen through the 0.229 mm thick walls of the tubings provides the oxygen requirements for nitrification of the wastewater. The hydraulic loading was varied by adjusting the flow rate of the synthetic sewage feed. Substrate loading was altered by changing the concentration of the synthetic sewage. This AMTF system provides complete nitrification of secondary sewage. When compared to other trickling filters, plastic and rock, it surpasses them in efficiency. The AMTF also requires less volume for the same removal than the rotating biological contactor and is competitive with the packed bed reactor. The Hy Flounit has a size advantage, but the AMTF does not require the recirculation.

THE FEASIBILITY OF USING FOREST LANDS FOR RECYCLING SLUDGE NUTRIENTS IN NORTHERN NEW ENGLAND, New Hampshire Univ., Durham. For primary bibliographic entry see Field 5E. W79-00446.

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES. Chicago Univ., IL. For primary bibliographic entry see Field 6D. W79-00453

A PILOT PLANT TRIAL FOR STERILIZATION OF FISH HA HATCHERY WATER, Idaho Univ., Moscow. For primary bibliographic entry see Field 5G. W79-00455

A STUDY FOR IMPROVING THE AEROBIC-MEDIA TRICKLING FILTER,

MEDIA TRICKLING FILTER, West Virginia Univ., Morgantown. W. R. Johnson, III. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 115, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1976. 97 p. 13 fig. 9 tab, 15 append. OWRT A-029-WV A(1), 14-31-0001-6051.

WATER QUALITY MANAGEMENT AND PROTECTION-Field 5

Ultimate Disposal Of Wastes-Group 5E

Descriptors: "Aerobic treatment, "Oxygenation, "Sewage treatment, "Trickling filters, "Waste water treatment, Aeration, Biological treatment, Equipment, Filters, Oxygen, Secondary treatment, Solid Contact Processes, Treatment, Waste treatment, Wastes, Water pollution treatment, Aerobic media, Aerobic-media trickling filter.

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Improvements in the original design and additional information about the operational capabilities are demonstrated in this bench-scale study of the aerobic-media trickling filter (AMTF), a new concept of biological wastewater treatment. The uniqueness of this fixed growth system is that the inert media also provides aeration. The aerobic media consists of 276 small teflon tubes bonded media consists of 276 small teflon tubes bonded into a pressurized oxygen manifold at one end of the unit and hanging in loops down the length of a vertical pipe flowing full of wastewater. Diffusion of pressurized oxygen through the very thin walls of the tubes provides the oxygen requirements. Recirculation is used to vary the hydraulic loading on the unit. Organic loading is varied by changing the concentration of the synthetic wastewater. This AMTF system accomplishes greater than 85 percent remova of BOD and is not adversely affected by excessive accumulations of slime. Its performance at high organic and hydraulic loadings indicates it would be amenable to secondary treatment of industrial and municipal wasterwaters or would perform well in a roughing process. Preliminary information also indicates a large unit-volume reduction in the AMTF compared to an oxygen-activated sludge unit or a pared to an oxygen-activated sludge unit or a plastic-media trickling filter. W79-00457

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES TUNNEL SYSTEM.

TUNNEL SYSTEM.

Booz-Allen Applied Research, Bethesda, MD.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 482,

Price codes: A20 in paper copy, A01 in microfiche.

Draft Environmental Impact Statement, March
1977, 468 p, 117 fig, 53 tab, 10 append. EPA 68-01
4372

Descriptors: "Tunnels, "Illinois, "Sewers, "Effects, Water storage, Drainage, Urban runoff, Sewage, Tunnel construction, Tunnel design, Environment, Rock, Groundwater, Infiltration, Waste water treatment, *Chicago(Ill), Des Plaines Tunnel, Environmental impact statements.

This environmental impact statement concerned the Lower Des Plaines Tunnel System, which con-sists of one waste treatment plant and one main storage reservoir. The tunnel system will reduce the pollutant load currently discharged to Chicago's waterways. Adverse effects include construction, and possible groundwater infiltra-tion or wastewater infiltration. (Sims-ISWS) W79-00465

5E. Ultimate Disposal Of Wastes

EFFECTS OF MUNICIPAL SEWAGE EF-FLUENT IRRIGATION ON THE TRACE METAL CONTENT OF EARTHWORMS, State Univ. of New York at Syracuse. Coll. of En-vironmental Science and Forestry. For primary bibliographic entry see Field 5C. W79-00009

METHOD OF DISPOSING OF WASTE WATER CONTAINING EMULSIFIED OIL, omo Electric Industries Ltd., Osaka (Japan). (Assignee).

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE SEEPING THROUGH SOIL CONTAINING SAID WATER, American Colloid Co., Skokie, IL. (Assignee). For primary bibliographic entry see Field 5G. W79-00034

TRANSPIRATION AND EVAPORATION OF SEWAGE EFFLUENT, Auburn Univ., AL. Engineering Experiment Sta-

For primary bibliographic entry see Field 5D. W79-00088

WASTE TREATMENT FOR A PROFIT, Long Island Lighting Co., Glenwood Landing, NY. For primary bibliographic entry see Field 5D. W79-00359

CASE HISTORY: ASH DISPOSAL FROM AN OIL FRIED CENTRAL STATION, Canal Electric Co., Sandwich, MA. S. R. Hall, R. W. Jones, B. W. Lyons, and P. W.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9048-0178 (50.75). In: Water-1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 158-162,

Descriptors: *Waste treatment, *Power plants, *Dewatering, *Sludge, Industrial wastes, Filtration, Magnesium oxide, Vanadium, Sludge disposal, Sludge treatment, Vacuum filtration, Drying, Slurries, Sulfur compounds, Recycling.

The ash disposal system of an oil-fired power plant run by Canal Electric Co. (CEC) of Sandwich, Massachusetts, is described. Because oil used in this plant contains vanadium and sulfur compounds, magnesium oxide (MgO) is added before firing to produce a dry friable ash and protect against corrosion effect of vanadium oxide (Y205). against corrosion effect of vanadium oxide (v. 202).
Based on experiences of neighboring plants, CEC decided on the following system for handling ash:
(1) keep ash in hoppers dry and hot (300F); (2) least ash released in precipitator fall freely into sluicing water flowing in the bottom of the lines to a waste water flowing in the bottom of the lines to a waste sump; (3) pump ash slurry to a convenient point for dewatering before disposal; (4) during boiler outages, remove the dry ash collected in furnace and ducts with manual labor or vacuum equipment and wash down remainder with resulting wash-water going to waste sump. After an investigative period during which dewatering equipment was rented, CEC decided to install Eimco vacuum rented, CEC decided to install Eimco vacuum drum, belt type filter equipment. The water to the thickener contains 150 to 400 mg/l suspended solids and the sludge produced contains approximately 15% solids. This is reduced to a cake form of 35% solids and 65% moisture at the end of the filter belt. These cakes are transported to purchaser for recovery of vanadium. (See also W79-00342) (Majtenyi-IPA) W79-00361

PRETREATMENT LAND APPLICATION OF TEXTILE PLANT WASTES, North Carolina State Univ., Raleigh. Dept. of North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering. M. R. Overcash, H. C. Koise, D. Rock, R. Marshburn, and D. Pal. Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-1645-0178 (\$1.55). In: Water-1977, AIChE Symposium Series, Vol 74, No 178, edited by G. F. Bennett, p 163-175, 1978, 5 fig, 7 tab, 5 ref.

Descriptors: *Industrial wastes, *Waste treat-ment, *Textiles, *Soil treatment, *Sludge disposal, Soil tests, Soil types, Clay loam, Soil-water-plant relationships, Soil survey, Cost-

benefit analysis, Sludge, Aerobic treatment, North Carolina, Soil chemistry, Crops, Waste assimila-tive capability, Sludge digestion, Nitrogen cycle.

The use of sludge from a nylon polyester plant for land application was studied and found to be technically feasible and economically attractive. However, reliable operating conditions and favorable economics depend on site specific design. Thus, extensive soil tests must be done, fundamental soil treatment mechanisms must be considered, and waste constituents and land needs must be defined. In the study done on waste produced by the American Enco plant in Clemson, South Carolina, three parameters were characterized: waste constituent generation, waste assimilatory capability, and land limiting constituent. Soil studies revealed that general soil characteristic is Hiwassee, consisting of sandy clay loam and sandy loam with substantial amounts of micaecous, non-expanding clay minerals. Soils are micaceous, non-expanding clay minerals. Soils are not expected to swell and shrink significantly with not expected to swell and shrink significantly with wetting and drying. Nitrogen, phosphorus, and oxygen demands of vegetative matter were reviewed and considered in final system design, which was ultimately based on nitrogen land area requirements. The system chosen includes two parallel aerobic digesters of 40,000 gal capacity which require between 10 to 20 days to produce applicable waste. The total waste system cost \$1.15 million with sludge application accounting for an estimated \$95,000. This was considered more-conomical, then other systems explosed (Sec. economical than other systems evaluated. (See also W79-00342) (Majtenyi-IPA)

EFFECT OF WHEY APPLICATION ON CHEMI-CAL PROPERTIES OF SOILS AND CROPS,

CAL PROPERTIES OF SOILS AND CROPS, Kraft, Inc., Glenview, II. D. S. Watson, A. E. Peterson, and W. G. Walker. Available from Copyright Clearance Center, Inc., New York, NY as 9065-8812-78-9811-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 176-186, 1978, 10 fig, 4 tab, 6 ref.

Descriptors: "Waste disposal, "Industrial wastes, "Whey, "Crop response, "Soil treatment, Soil water movement, Soil chemistry, Nutrients, Nitrogen, Phosphorus, Potassium, Soil properties, Irrigation, Experimental farms, Groundwater, Sinks, Dairy industry.

Land disposal of whey derived from Kraft, Inc. dairy processing plants was evaluated. Studies were carried out at experimental farms on the efwere carried out at experimental farms on the effects of spreading whey on soil or adding it in irrigation water. Results indicated that whey is beneficial to plants requiring large amounts of nitrogen. Tissue analysis was done to determine use of various elements found in the whey and indicated that calcium-phosphorus balance may be affected; but, even under maximum dosing conditions, no significant effect on the suitability of corn as animal feed was detected. Buildup of phosphorus and potassium in the soil were studied and these elements showed little tendancy for downward movement in the soil. Buildup is in direct proportion of the amount of applied in the whey. It is concluded that the soil acts as a vast sink for holding these nutrients until required for further crop production. Plant nutrients in whey sometimes move down into the soil beyond the principal root zone, occasionally to a depth of 9 feet in some areas. However, the likelihood of soil nutrients passing through the examined zones into groundwater does not appear significant and a brief examination of groundwater at one site confirmed this. (See also W79-00342) (Majtenyi-IPA) W79-00363

SLUDGE TREATMENT BY SUPERSONIC JET-FLAME.

Tokyo Univ., Tokyo (Japan). Z. Hokao.

Japan Pulp and Paper, Vol. 15, No. 3, p 43-48, October, 1977. 6 fig, 1 illus.

For primary bibliographic entry see Field 5D. W79-00020

Group 5E-Ultimate Disposal Of Wastes

Descriptors: *Sludge treatment, *Pulp wastes, *Dewatering, *Heat treatment, Burning, Disposal, Incineration, Pulp and paper industry, Sludge, Water pollution sources, Water pollution control, Mathematical studies, Estimating equations, Equations, Cooling water, Temperature, Costs, Thermal insulation, Oil spills, Absorbents, Ultimate disposal mate disposal.

The ignition of kerosene-fired jet burners used in the treatment of paper mill sludges (about 80% moisture content) is described. Mathematical equations are presented for calculating the nozzle exit and throat temperatures, velocities, and specific weights; the throat pressure and crossctional area; the air flow rate; and the amount of cooling water required to protect the nozzles and combustion chamber. A flow sheet and cost data are given for a jet-flame plant treating paper mill sludge. Studies are reviewed in which the cottonlike product is used as an oil absorbent or heat insulator. (Sw W79-00403 or. (Swichtenberg-IPC)

A STUDY OF THE FATE OF BIOSOLIDS FROM BIOLOGICALLY TREATED EFFLUENT IN LABORATORY AND CONSTRUCTED

STREAMS, National Council of the Paper Industry for Air and Stream Improvement, Inc., New York.
For primary bibliographic entry see Field 5C.

AND EARLY GROWTH OF SURVIVAL SELECTED TREES ON WASTE WATER APPLI-CATION SITES

North Central Forest Experiment Station, St. Paul MN J. H. Cooley.

Department of Agriculture, forest Ser Research Note NC-231, 4 p, 1978. 1 ref, 4 tab.

Descriptors: *Irrigation, *Trees, *Sewage effluents, Wastes, Waste water disposal, Waste water(Pollution), Water pollution sources, Oxidation ponds, Effluents, Ash trees(Fraxinus), Oak total ponus, Estiuents, Ash trees(Fraxinus), Oak trees(Quercus), White-cedar trees(Thuja oc-cidentalis), Cottonwood(Populus delroides), Weeds, Conifers, Deciduous trees, Larch trees(Larix), Poplar trees(Populus), Hybrids, Tulip-trees(Liriodendrion).

The response of six tree species (Larix leptolepis, Larix decidua, Liriodendron tulipifera, Quercus rubra, Fraxinus pennsylvanica, and Thuja oc-cidentalis) and three Populus hybrids to irrigation with oxidation pond effluent were compared. When weeds were intensively controlled, a Populus deltoides x nigra cross responded best, but when weeds were less intensively controlled, P. canescens x tremuloides responded best. (Witt-IPC) W79-00422

A NOTE ON EFFECTS OF SEWAGE EF-FLUENT IRRIGATION ON SPECIFIC GRAVI TY AND GROWTH RATE OF WHITE AND RED

Missouri Univ.-Columbia. School of Forestry, Fisheries and Wildlife.

P. S. Szopa, L. C. Tennyson, and E. A. McGinnes,

Wood and Fiber, Vol. 8, No. 4, p 253-256, Winter, 1977. 3 fig, 9 ref, 1 tab.

Descriptors: *Sewage effluents, *Irrigation effects, *Oak trees, *Specific gravity, *Growth rate, Deciduous trees, Wastes, Waste disposal, Water pollution sources, Waste water disposal, Fertilization, Forest management, Irrigation, Trees.

Increment cores at breast height were removed from 41 white oak (Ouercus alba and O. Stellata) and 51 red oak (Q. coccinea and Q. velutina) trees growing on 2.5 acres in southern Missouri which

was sprinkler-irrigated with treated sewage effluent. Growth rate increased significantly for white oaks but not for red oaks while specific gravity increased only for the red oak group. White oak trees of the larger diameter classes White oak trees of the larger diameter classes responded more favorably to treatment than trees in the smaller diameter classes. Red oak response appeared to be independent of diameter class for specific gravity data. The difference in age between the red and white oaks may have been an important factor in observed treatment effects. vichtenberg-IPC) W79-00425

THE FEASIBILITY OF USING FOREST LANDS FOR RECYCLING SLUDGE NUTRIENTS IN NORTHERN NEW ENGLAND,

New Hampshire Univ., Durham

Available from the National Technical Informa Avanable 10th the National Technical Information Service, Springfield, VA 22161 as PB-288 067, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, May 1977. 88 p. 22 fig, 6 tab, 120 ref. OWRT A-039-NH(3), 14-31-0001-4029.

Descriptors: *Sludge disposal, Forest soils, Natureal resources, Vegetation, Liquid waste, rates of application, Methods of application, *Recycling, Waste disposal, *New England, Ionic concentrations, Chemistry of soil water, Streams, Lysimeters, *New Hampshire

Dewatered and limed sludge was obtained from a primary treatment plant and spread at two rates, 25 and 125 wet t/ha, on sandy loam soils in a northern hardwood forest in N.H. Changes in soil water chemistry were assessed using water samples collected at 20 and 45 cm depths with suction lysimeters. The 125 t/ha rate caused an increase in the concentration of most ions in soil water during the first two years following application. At the 20 cm depth, just below the organic horizons, Cl reached a mean maximum of 27.5 mg/l after sludge application compared to control values of less than 0.3 mg/l. SO4 eventually increased 8-9 mg/l soon after application. Mean Ca values rose to over 13.5 mpared to background concentrations of about 2 mg/l. Mg, Na, K, H, and NO3 ions showed maximum increases in concentration that averaged 2 to 3 fold greater than their control values of less than 0.5 mg/l. NH4 and total P were unaffected by the sludge application. At the 45 cm depth, just above a fragipan, the increases in ionic con tions following the 125 t/ha application of sludge were less than one-half the increases that occurred at 20 cm depth. Within one year after the sludge was spread, the concentrations of most ions were smilar in the treated and control plots. Soil water chemistry at the 45 cm depth was similar to stream water chemistry in the study area. The changes that occurred in soil water chemistry at this depth after applying sludge at the heavy rate could reflect potential changes in stream water chemistry. The temporary enrichment of soil water nutrients after sludge application had minimal im-pact on the frequency and diversity of native herbs and shrubs and on basal area growth of trees. W79-00446

LEACHING CHARACTERISTICS OF VARIOUS HEAVY METALS, NON-HEAVY METALS AND ANIONS FROM MUNICIPAL SEWAGE ANIONS FR. SLUDGE ASH.

Connecticut Univ., Storrs. For primary bibliographic entry see Field 5B.

SIMPLE MODEL FOR OCEAN OUTFALL PLUMES

General Dynamics Corp., Pomona, CA. For primary bibliographic entry see Field 5B.

5F. Water Treatment and **Ouality Alteration**

WATER FILTERING AND DISPENSING AP-PARATUS, E. N. Martin

E. N. Marun. U.S. Patent No. 4,086,166, 9 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1432-1433, April 25, 1978.

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Descriptors: *Patents, *Water treatment, *Water purification, *Water quality control, Filtration, Filters, Domestic water, Water conservation,

An improved water filtering, storing and dispensing apparatus is adapted to be connected with a pressurized municipal service water system to filter, purify, or upgrade the quality of the service system water, and store all of the filtered water produced for subsequent dispensing on demand. Waste water or brine which is the by product of filtration is utilized as a motive fluid to act upon and effect pressure dispensing of stored filtered water. The apparatus operates to make and to store a limited predetermined volumetric supply of filtered water for dispensing and use, upon demand. It operates to consume service water and produce filtered water only when less than a full supply of filtered water is present and which shuts off automatically to stop all flow when a full supply of filtered water is present. W79-00019

LOW MOLECULAR WEIGHT HYDROLYZED POLYACRYLAMIDE USED AS A SCALE IN-HIBITOR IN WATER SYSTEMS, American Cyanamid Co., Stamford, CT.

(Assignee). D. S. Song, R. J. Duffy, C. R. Witschonke, A. M.

Schiller, and M. A. Higgins.
U.S. Patent No 4,085,045, 3 p, 9 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1058, April 18, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, *Scaling, Chemical reactions, Hydrolysis, Corrosion control, Antiprecipitants.

A process for inhibiting scale formation uses a low molecular weight hydrolyzed polyacrylamide prepared by a process involving simultaneously and continuously charging separate streams of acrylamide monomer, ammonium persulfate (as catalyst) and mercaptoalkaonic acid (as chain transfer agent) to a reaction zone containing water under reflux. The rate of charging is such that the heat of polymerization is sufficient to maintain reflux in the reaction zone without exceeding the capacity of the condenser to remove the heat of reaction. Then the polymer product is reacted with sufficient aqueous caustic to hydrolyze from about 60 to 90% of the amide groups in the polymer product. (Sinha-OEIS) W79-00027

TREATMENT OF WATER OR AQUEOUS

SYSTEMS, Ciba-Geigy Corp., Ardsley, NY. (Assignee). A. Harris, J. Burrows, and T. I. Jones. U.S. Patent No. 4,089,796, 5 p, 1 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1031, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Demineralization, Scaling, Corrosion, Corrosion control, Additives, Zinc, Chemical reactions.

A process is provided for inhibiting the corrosion and scale forming tendencies of water or an aque-ous system which comprises treating the water with from 0.1 to 500 ppm of an additive combina-tion comprising from 2.5 to 80% by weight of zinc (calculated as Zn++) and from 97.5 to 20% by

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Treatment and Quality Alteration—Group 5F

weight of hydrolysed polymaleic anhydride, or of a water soluble salt of such hydrolysed polymaleic anhydride. (Sinha-OEIS) W79-00039

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BATTERY OPERATED WATER PURIFICA-TION SYSTEM, Sachs-Systemtechnik G.m.b.H., Schweinfurt

Sacns-Systemetering (West Germany).

W. Fischer, and B. Hengst.

U.S. Patent No. 4,089, 768, 9 p, 4 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1024, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Electrolysis, Electric currents, Direct current, Equipment, Waste water treatment, Portable equipment, Bat-

The proper operation of an electrolytic cell for water purification requires an adequate current to be passed between electrodes of the cell and an oe passed between electrodes of the cell and an adequate dwell time of the water in the cell. The current flow through the cell depends on the conductivity of the raw water which is not predicable and not capable of being controlled. With water low in mineral content, the conductivity may be low in mineral content, the conductivity may be quite low and is not affected by organic contaminants. A water purification system which is self-contained and portable, sufficiently flexible to operate on a wide variety of water sources, and simple to operate, yet capable of reliably disinfecting water carrying pathogenic microorganisms thus should be capable of supplying a relatively high voltage. The weight of a battery is directly proportional to the outpout voltage, yet a portable water purification unit should be as light as possible. To achieve its objects the invention provides a water purification unit should be as light as possible. To achieve its objects the invention provides a water purification system including an electrolytic cell in which the dwell time of the water in the cell is maintained by a pump which supplies raw water and causes purified water to be discharged at a fixed rate. The unit may employ a battery of relatively low output voltage and correspondingly low weight because a D.C. power supply circuit receiving energy from the battery furnishes a D.C. output voltage exceeding the battery voltage to the electrolytic cell. (Sinha-OEIS)

WATER DISTILLER WITH CONE SHAPED CONDENSER, F. C. Kirschman, and W. B. Bolte.

U.S. Patent No. 4,089,750, 6 p, 2 fig, 11 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 1019, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, *Distillation, Condensation, Equipment.

A water distiller arrangement provides for an effi-cient distillation process where the inlet water supply is controlled as a function of the temperature of the output of the distiller, and inlet water is preheated in an interior chamber surrounded by a preneated in an interior chamber surrounded by a passageway through which the water vapor passes after leaving the boiling chamber and while it con-denses. The unit is quite compact because of the inclusion of the preheat chamber and condensing chamber in spaces that normally would be unoccu-pied in distillers where the chambers are stacked one on top of the other, and at the same time the construction is simplified and assembly time and costs reduced. (Sinha-OEIS)

W79-00045

APPARATUS FOR PRODUCING HIGH-PURITY

WATER,
Department of Health, Education and Welfare,
Washington, DC. (Assignee).

N.A. Karamian.
U.S. Patent No. 4,089,749, 9 p. 4 fig, 2 tab, 11 ref;
Official Gazette of the United States Patent Office, Vol 970, No 3, p1019, May 16, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Distillation, Condensation, Equipment, Toxins, Endotoxins.

Condensation, Equipment, Toxins, Endotoxins.

In pharmaceutical work it is important that the water used for the preparation of parenteral solutions be free from endotoxins. The water used for this purpose is normally made by distillation. During distillation, the endotoxins in the feed water carry over by entrainment and contaminate the distillate. In order to prevent endotoxins and other impurities from entering the distilled water, the still must be designed to prevent creepage and entrainment. The water in a storage vessel must also be kept sterile and protected from chemical contamination. The apparatus of this invention includes a distillation flask, a carboy and a condenser unit, all of borosilicate glass. A respective filter is provided between the ambient atmosphere and the interiors of the flask, the carboy and the condenser unit to remove airborne bacteria and dust particles. In injet valve is provided for feeding water into the flask, all water-contacting parts of this valve being of polytetrafluoroethylene. The open parts are interconnected with flexible, polytetrafluoroethylene tubing. A two-way, stop-cock allows high-purity water to be removed from the carboy. (Sinha-OEIS)

AUTOMATIC SYSTEM CLEANER FOR REMOTE MONITOR, For primary bibliographic entry see Field 5A. W79-00051

EMPLOYING METHYLENE PHOSPHONATES OF OXYALKYLATED POLYALKYLENE POLYAMINES IN CHELATION AND/OR SCALE INHIBITION,

Petrolite Corp., St. Louis, MO. (Assignee).

Petrolite Corp., 33, Load, 79, 8 p. 4 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 635, May 9, 1978.

Descriptors: *Patents, *Water treatment, *Scaling, Chemical reactions, *Chelation, Corrosion control.

Compounds used as scale inhibitors, chelating agents etc. consist of methylene phosphonates of oxyalkylated polyaklylene polyamines having at least three nitrogen atoms wherein there are nitrogen-bonded methylene phosphonate units of the formula - CH2PO(OM)2. (Sinha-OEIS) W79-00052

PROCESS FOR THE TREATMENT OF WATER SOLUTION BY ION EXCHANGE. Hager and Elsaesser, Stuttgart-Vaihingen (West

Germany). (Assignee). . Marquardt.

U.S. Patent No. 4,088,563, 21 p, 12 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 632, May 9, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, *Desalination, *Water softening, Ion exchange, Resins, Equipment, Regeneration, Backwashing.

The treatment of water such as preparation, softening and/or desalinating is accomplished by ion exchange processes. In the quasi-continuous treatment, the ion exchange resins are conducted through a treatment container and a regenerating-and-washing-column. The ion-exchange resins leave the liquid treatment container through a bottom fungel and before entering the recentaring. tom funnel, and before entering the regenerating-and-washing-column flow into a rinsing tank in which they are thoroughly re-rinsed at lease once during each entire cycle. The removal of the ion-exchange resins from the rinsing tank and from the regenerating-and-washing-column is by means of an immersion tube at the top of the regenerating-

and-washing-column, the depth of immersion of the immersion tube being adjustable according to the volume in the bottom funnel of the treatment container. (Sinha-OEIS) W79-00054

WATER HARDNESS AND CARDIOVASCULAR MORTALITY, Ottawa Univ. (Ontario). Dept. of Epidemiology

and Community Medicine.
For primary bibliographic entry see Field 5C.
W79-00171

WATER TREATMENT: IRON, BOILER WATER

AND WATER ANALYSIS.
Ground Water Age, Vol. 13, No. 1, p 19-23, September, 1978. 2 fig.

Descriptors: "Water treatment, "Iron, "Manganese, "Chemical feed pumps, "Boilers, Water analysis, Water sampling, Corrosion, Scaing, Oxidation, Filtration, Bioassay.

Iron and manganese impart a metallic taste to water, cause stains on tableware, plumbing fixtures and laundry, and form sludge deposits in piping, pressure tanks, water heaters, etc. In small concentrations they can be removed with an ordinary softener. For medium concentrations an oxnary softener. For medium concentrations an ox-idizing filter is used which requires periodic-regeneration with potassium permanganate. For high concentrations, chlorination with a chemical feed pump and filtering is required. Low-pressure boiler water treatment is especially important since scale or sludge reduce boiler efficiency and water flow and corrosion damages the heating system. Contaminants in boiler water come from system. Contaminants in boiler water come from three sources: (1) incoming feed water; (2) installa-tion by-products; and (3) products of corrosion. The proper start-up procedure for boilers is out-lined. This is the most important means of prevent-ing trouble in boiler water. After start-up, boilers should undergo periodic oil emulsification, rust prevention, scale elimination and foaming control to maintain the water in proper condition. Small leaks can be plugged with 'ston leaks' Foat driekleaks can be plugged with 'stop leaks.' For drink-ing water, periodic bio-analyses are strongly recommended. The proper procedure for water sampling is outlined and several sample analyses, indicating different water problems and treatment solutions, are discussed. (Purdin-NWWA) W79-00176

WHAT'S IN THE WATER, A LOOK AT THE PROPOSED EPA REGULATIONS FOR OR-GANIC CHEMICALS IN PUBLIC WATER SUP-PLIES. M. R. Richard.

Water Well Journal, Vol. 32, No. 10, p 68-71, October, 1978.

Descriptors: *Water treatment, *Activated car-bon, *Organic wastes, *Water pollution control, Municipal water, Regulation, Carcinogens

The U. S. Environmental Protection Agency, after finding organic chemicals in the drinking water supplies of many cities, has proposed regulations for the removal of organics by treatment with granular activated Carlon (GAC). Recent studies uggest that organics cause cancer at high dosage levels, but whether they are carcinogenic in trace quantities is questionable. Techniques to identify organics vary widely and lack precision. Thus, it is difficult to tell whether GAC can remove a substantial percentage of organics. GAC itself may contain carcinogenic substances or become a medium for bacteria, molds and algae, all of which could add toxic substances to the water. Since GAC has never been used in the U. S. for organics, the EPA and water systems managers disagree concerning the regeneration frequency and cost of carbon beds. More research is needed to test GAC and other techniques for organics control, such as adsorption, disinfection, resin beds and aeration.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5F-Water Treatment and Quality Alteration

It is hoped that effective, practical alternatives to the proposed regulations can be developed. W79-00179

ON THE VERTICAL DISTRIBUTION AND SEASONAL DEVELOPMENT OF THE DENSITY OF DREISSENA POLYMORPHA LARVAE IN THE PELAGIC ZONE OF THE LAKE OF ZURICH (IN GERMAN),

Gesundheitsinspektorat (Switzerland).

P. Suter-Weider, and U. Zimmermann Schweiz Z Hydrol 38(2), p 159-170, 1976.

Descriptors: Lakes, *Lake of Zurich, *Mussels, Larvae, Water pollution control, Water treatment.

The freshwater mussel D. polymorpha Pallas was sighted for the 1st time in Lake Zurich about 1969. This indicated a problem for the treatment of the lake water. By means of a pump and vertical net hauls more information was added to that existing on Lake Zurich. Additional dates about tempera ture, depth of Secchi disk visibility and beam transmittance were collected. The larvae of D. transmittance were collected. The larvae of D. polymorpha appeared at the beginning of June. Following the mean temperature of the epilimmion the number of individuals/m2 reached a maximum of 210,000. The greatest concentration of larvae measured in 1974 was 54,375/m3 at a depth of 4 m. The last appearance of D. polymorpha was observed at the end of Oct.—Copyright 1978, Biological Abstracts, Inc. W79-00280

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2. Office of Water Research and Technology, Washington, DC.

For primary bibliographic entry see Field 5D. W29-00306

WATER -- 1977.

American Inst. of Chemical Engineers, New York. For primary bibliographic entry see Field 5D.

ON-SITE GENERATION OF HYPOCHLORITE SOLUTIONS BY ELECTROLYSIS OF SEA-WATER, Diamond Shamrock Corp., Painesville, OH.

I. E. Bennett.

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9617-0178 (\$0.95). In: Water-1977, AIChE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 265-269, 1978, 4 fig, 13 ref.

*Sea Descriptors: water. *Electrolysis. *Chlorides, Hypochlorite, *Disinfectant, Waste water treatment, Chlorine, Hydrogen, Anodes, Electrochemistry, Electrodes, Salinity, Municipal wastes, Industrial wastes.

Electrolysis of sea water was evaluated as a method of on-site generation of hypochlorite and found to be a feasible alternative to using chlorine or purchased hypochlorite as a disinfectant. Laboratory testing was followed by studies using large, production-size cells capable of producing 1200 lb of available chlorine a day using four 300-lb cells in hydraulic series. These cells were built of polyvinyl chloride to protect against the corre-sive action of hypochlorite, and acrylic covers were used for better visibility. Chlorine is generated at the anode according to the reaction, 2Cl(-) = Cl2 = 2e(-). Chlorine immediately undergoes hydrolysis to hypochlorite, Cl2 = H2O = HClO + Cl(-) + H(+). Of course, other competing reactions do take place but their effects can be minimized by proper cell design, choice of electrode materials, and choice of operating parameters. Sea water containing 50% to 100% average salinity can be electrolyzed to produce hypochlorite solutions of 1 - 4 g/l available chlorine. AC power consumption ranges from 1.5 to 2.9 kwh per pound of chlorine depending on temperature and salinity of the sea water. The process also produces 5.8 cu ft of hydrogen per pound of available chlorine according to the equations: HClO = ClO(-) + H(+) and 2H(+) + 2e(-) = H2. Hydrogen must be disengaged from the hypochlorite stream before use, to prevent explosion hazards. It can be burned for fuel or vented to the atmosphere. (See also W79-00342) (Majtenyi-

RURAL WATER SUPPLIES FROM LATERITE RUNOFF

ligeria Univ., Nsukka. Dept. of Civil Engineering. N. Egbuniwe.

Water Resources Bulletin, Vol. 14, No. 2, April 1978, p 466-469. 1 fig, 3 tab, 4 ref.

Descriptors: "Water supply, "Runoff, "Laterites, "Nigeria, Rural areas, Sedimentation, Dry season, Floccualtion, Wood ash, Clear water, Turbudity, Coliform count, Plate count, "Water treatment, Water quality.

Villagers living around Nsukka in Eastern Nigeria derive their water supplied during the dry season by subjecting the runoff from laterite soils to five months' sedimentation. This study found that by flocculating the runoff with wood ash at a dose of 5 g/l, clear water-with turbidity of less than 5 JTU, Fe of less than 1 me/l. Coliforn JTU, Fe of less than 1 mg/l, Coliform count zero MPN, and Plate count of less than 5 colonies--was achieved after three days sedimentation. (Bell-Cornell)

STUDIES OF ION EXCHANGE AND CHELA-TION COMPOUNDS ADSORBED ON GRANU-LAR GRAPHITE, West Virginia Univ., Morgantown.

For primary bibliographic entry see Field 5D. W79-00431

CONTINUOUS ELECTROCHEMICAL SYNTHE-SIS USI

West Virginia Univ., Morgantown. For primary bibliographic entry see Field 5D. W79-00432

5G. Water Quality Control

ECOLOGICAL SYSTEM AND METHOD,

R. E. Burton U.S. Patent No. 4,086,161, 10 p, 6 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No. 4, p 1430-1431, April 25, 1978

Descriptors: *Patents, *Water quality control, Eutrophication, Ecology, Bodies of water, Biological communities, Aquatic algae, Balance of Nature Bark.

An ecological system and method for counteracting the effects of excessive nutrient deposition (eutrophication) in bodies of water such as marshlands, inland ponds and lakes makes use of clusters of substantially individualized bark fibers positioned in upper, relatively oxygen-rich zones of such bodies of water. The bark clusters function to attract and hold excessive nutrient deposition in the form of colloidal wastes (e.g., colloidal solids of various types, single cell bacteria, etc.) and aquatic algae produced, while at the same time providing a safe habitat for algae predators and feeders in the form of minute animal organisms (e.g., crustacea, rotifers, snails, zooplankton, etc). The isolation and dispersion of the bark fiber clusters on the surface of the threatened bodies of water serves to prevent a disruptive imbalance between the algae and algal feeders by providing increased areas for life and surface breeding of various types of algae predators to thereby main-tain essential trophic balance. (Sinha-OEIS)

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SKIMMING APPARATUS, N. J. R. Hartwick, and D. C. C. Lathe. U.S. Patent No 4,085,049, 9 p, 7 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1059, April 18, 1978.

Descriptors: *Patents, *Water pollution treatment, *Water pollution control, Oil pollution, Skimming, Water quality control, Equipment.

A device for removing oil and like products from the surface of water comprises at least a pair of spaced float members with an interconnecting shaft and a elongated, open sided reservoir having a weir edge. The cylinder reservoir is mounted on the shaft for free rotation. The central longitudinal axis of the reservoir is offset to the rear with respect to the axis of the shaft so that floatation of the reservoir lowers the front weir edge to allow fluid to enter the reservoir over the weir. Removal of skimmed fluid from the reservoir controls the depth of skim. (Sinha-OEIS)

SOLID-FLUID CONTACTING PROCESS, Ashi Kasei Kogyo Kabushiki Kaisha, Osaka

(Japan). (Assignee).

T. Misumi, T. Miyaji, and M. Kasai.

U.S. Patent No 4,085,042, 6 p, 2 fig, 3 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 1057, April 18, 1978.

Descriptors: *Patents, *Water treatment, *Water quality control, Adsorption, Resins, *Solids contact process, Ion exchange, Countercurrent flow,

A fixed-bed solid-fluid contacting process is pro-vided comprising passing a fluid to be treated through a treatment zone packed with solid particles in one direction, regenerating the solid particles on depletion in activity by passing a fluid for activation in a direction opposite to the flowing direction of the fluid to be treated, washing the solid particles of contamination by extracting a portion of the solid particles simultaneously with the passing of the fluid to be treated through an outlet arranged in a position opposite to the flow-ing direction of the fluid to be treated to transport into a washing zone which is furnished separately from the treatment zone and recycling the washed solid particles into the treatment zone. The process is improved in the time cycle of treatment which is shortened and the pressure loss which is decreased. The process is also free from disturbance of bed and excellent in treatment efficiency. Typical example of application is ion exchange reaction. (Sinha-OEIS) W79-00029

METHOD AND COMPOSITION FOR PREVENTING WATER CONTAMINATED WITH INDUSTRIAL WASTE SEEPING THROUGH SOIL CONTAINING SAID WATER, American Colloid Co., Skokie, IL. (Assignee).

U.S. Patent No. 4,084,382, 4 p. 5 ref; Official Gazette of the United States Patent Office, Vol. 969, No. 3, p 836, April 18, 1978.

Descriptors: *Patents, *Soil sealants, *Seepage, *Industrial wastes, Waste water disposal, Bentonite, Expansive soils, Containment.

A method is disclosed for containing water having a high concentration of water-soluble industrial waste which, when in contact with bentonite, disintegrates the bentonite thereby allowing seepage of water through the soil. A soil sealant composiproviding eding of

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tion consisting essentially of bentonite, a water-soluble dispersing agent, and a water-soluble polymer is mixed with the soil. The water-soluble polymer is selected from the group consisting of polyacrylic acid, hydrolyzed polyacrylonitrile, polyvinyl acetate, polyvinyl alcohol, copolymers of the foregoing, and a copolymer of acrylic acid and maleic anhydride. The amount of water-soluble polymer is from 0.1 to 3.0% by weight, and the amount of water-soluble dispersent is from 0.1 to 3.0% by weight. The weight ratio of water-soluble dispersant to water-soluble polymer is from 6.1 - 36%. The soil sealant composition when mixed with soil forms a water-containing enclosure. (Sinha-OEIS) tion consisting essentially of bentonite, a water-(Sinha-OEIS) W79-00034

OIL FENCE, A.B. Sjuntorp (Sweden). (Assignee). R. G. Hallhagen. U.S. Patent No. 4,084,380, 6 p, 6 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 969, No 3, p 835, April 18, 1978.

Descriptors: *Patents, *Oil pollution, *Water pollution treatment, *Water quality control, Barriers, Floating, Oil fences, Containment.

An oil fence is especially adapted for defining of impurities on a water surface and is made of a web of cloth shaped material exhibiting alternating connected portions and multiple layer portions made in such a manner that pockets and/or channels are formed to receive float bodies for the support of the oil fence in water, and sinking weights in order to give the oil fence the intended upright position in the water. The cloth shaped web is comprised of an impregnated and/or coated textile material which is woven. The single layer portions are shaped from the interwoven weft of the converging layers of the adjacent multiple layer portions, thereby obtaining an extremely strong connection. (Sinha-OEIS)

BELT TYPE OIL REMOVAL UNIT, Tenco Hydro/Aerosciences, Inc., Countryside,

Items Hydrofferostatices, and H. L. (Assignee).
G. A. Ettelt, and A. L. Cohen.
U.S. Patent No. 4,089,784, 4 p, 3 fig, 13 ref; Official Gazette of the United States Patent Office, Vol 970, No. 3, p 1028, May 16, 1978.

Descriptors: *Patents, *Oil pollution, *Water pol-lution treatment, *Water pollution control, Skimming, Equipment, Separation techniques, Rotary drums, Endless belts.

A system is provided for removing accumulated oil from a basin. An endless belt for carrying oil is partially submerged in the basin and is driven and supported by a rotary drum. The rotary drum has an irregular surface for frictional cooperation with the belt and a spring-biased roller urges the belt against the irregular surface. The oil scraping means comprises an oil wiper on the downstream side of the drum and the system further includes means for wiping the underside of the drum sur-W79-00040

WATER DISTILLER WITH CONE SHAPED

CONDENSER, For primary bibliographic entry see Field 5F. W79-00045

APPARATUS FOR DEPLOYING AND TAKING UP AN OIL FENCE, Mitsubishi Electric Mfg. Co. Ltd., Amagasaki

T. Kinase, I. Yano, K. Okubo, H. Kitakoga, and H. Tayama.

U.S. Patent No. 4,089,178, 10 p. 19 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 833, May 16, 1978.

Descriptors: *Patents, *Oil spills, *Warer pollu-tion control, Water quality control, Barriers, Equipment, Floating, Oil fences, Containment, Deployment.

An apparatus for deploying and taking up an oil fence for housing and spreading it in a simple manner with a high efficiency comprises, in combination, a floating framework having side walls defining a substantially enclosed receiving space in which an oil fence is to be stored with its width vertical. One side of the framework is partly cut away to provide an opening into the receiving space. A guide comprised of rollers is placed at the opening with the axes of the rollers vertical to that the width of the oil fence is always vertical. W79-00048

PROCESS AND APPARATUS FOR SEPARATING OIL FROM WATER CONTAMINATED WITH OIL.

Fujisash Industries, Ltd., Kawasaki (Japan). (Assignee). T. Yoshioka, and S. Iwanami.

U.S. Patent No. 4,088,578, 12 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 2, p 637, May 9, 1978.

Descriptors: *Patents, *Water pollution treatment, Water quality control, *Oil pollution, Separation techniquesm Specific gravity, Equipment, Bilge

Water contaminated with oil, such as bilge water, is pumped into a closed vessel. Separation of the oil and water is accomplished due to the floating of oil on the water because of their different specific gravities. The separated oil is sucked through a conduit to discharge the separated oil and reduce the pressure of the liquid phases. The purified water is discharged through a conduit provided with a non-return valve. The purified water is forced to flow through the conduit by the pressure of a stream of bilge water which flows into the container. (Sinha-OEIS)

METHOD FOR DEPOLLUTING FRESH AND SEA WATER FROM PETROLEUM PRODUCTS, Snam Progetti S.p.A., Milan (Italy). W. Marconi, R. Olivieri, L. Degen, and A. Robertiello

U.S. Patent No. 4,087,356, 6 p. 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 970, No 1, p 237, May 2, 1978.

Descriptors: *Patents, *Water pollution control, Water quality control, *Oil pollution, Biodegradation, *Microbial degradation, Nitrogen compounds, Microorganisms, Dispersion, Freezedried hydrocarbon-oxidizing microorganisms.

Microorganism cultures used for oxidizing the hydrocarbons are integrated by lipophilic and floating compounds which contain slow-release nitrogen in a form which can be assimilated by such microorganisms. Ureidic derivatives of higher aldehydes are the preferred compounds. Inert supports can be used, if necessary, and still better results are achieved when using also nonionic dispersants and freeze-dried hydrocar-bon-oxidizing microorganisms. The substances can be stored for indefinitely long times, do not belong to the category of toxic products, can easily be shipped to the place of their use, and can easily be spread over the polluted surfaces. The easily be spread over the polluted surfaces. Ine used nutrients accelerate a natural biological degradation process of the pollutants without disturbing the ecological equilibrium. On comple-tion of the use no more residues are left and, in the case of porous bodies, the residues are nothing but minerals which already exist in the natural environment (Sinha-OEIS)
W79-00058

ADAPTATIONS AND RESISTANCE TO ANOX-ADAPTATIONS AND RESISTANCE TO ANOX
IA IN CLOEON DIPTERUM
(EPHEMEROPTERA) AND NEMOUR./
CINEREA (PLEC OPTERA),
Uppsala Univ. (Sweden). Inst. of Zoophysiology.
B. Nagell, and T. Fagerstrom.
Oikos, Vol. 30, p 95-99, 1978. 7 fig, 1 tab, 10 ref.

Descriptors: *Mayflies, *Stoneflies, *Oxygen requirements, *Water temperature, Insects, Insect behavior, Adaptation, Habitats, Mortality, Larval growth stage, Ponds, Seasonal, *Acclimation.

e survival of larvae of Cleon dipterum and Nemoura cinerea was studied after exposure to anoxia for 40 h at temperatures between 0C and 11.5C. If the larvae were acclimated to 2C for 6 wk C. dipterum survived temperatures close to 0C better than N. cinerea. If they were acclimated to 10C, most C. dipterum died at all experimental temperatures. N. cinerea died to 60% at 5C; at higher or lower temperatures the mortality in-creased. A 6-d stay in 2C of C. dipterum previ-ously acclimated to 10C was not long enough to in-duce resistance to anoxia. When exposed to anoxia N. cinerea became unconscious within 10 min. whereas larvae of C. dipterum did so first within 60 min. It is concluded that a long term acclimaton to low temperatures induces in C. dipterum but not in N. cinerea a high degree of resistance to anoxia at temperatures close to 0C. This resistance is of great importance for C. dipterum since in cold temperated regions this species usually overwin-ters in anoxia conditions. The different rate at which the species lose consciousness in in anoxia may be important for their survival in natural habitats. (EIS-Deal) W79-00076

ENVIRONMENTAL MANAGEMENT STRATE-GY FOR THE GREAT LAKES SYSTEM. International Reference Group on Great Lakes Pollution from Land Use Activities. July, 1978. 134 p, 15 fig, 24 tab, 95 ref, 4 append.

Descriptors: *Great Lakes, *Environmental control, *Water quality, *Land drainage, *Sediment, *Water pollution sources, Pollution, Phosphorus, Mercury, Bacteria, Erosion, Lead, Pesticides, Polychlorinated biphenyls, Eutrophication, Lake Erie, Lake Huron, Lake Ontario, Lake Michigan, Lake Superior, Tributaries, Organic compounds, Microorganisms, Trace elements, Nitrogen, Chlorides, Asbestos, Viruses, Land use, Watersheds(Basins), International commissions.

Results are presented of a study of pollution of the boundary waters of the Great Lakes system by land drainage (including ground and surface runoff and sediment) from agriculture, forestry, urban and industrial land development, recreational and parkland development, utility and transportation systems, and natural sources. Land drainage is the source of pollutants such as phosphorus, bacteria, polychlorinated biphenyls, pesticides, industrial organic chemicals, mercury, and lead. Each pollutant is discussed in terms of background, sources, concentrations, and control recommendations.
Factors involved in production of pollutants, such as land characteristics, land use intensity, materials usage, and meteorology of the region are described. Management strategy for the Great Lakes ecosystem is outlined and recommendations are made which stress site-specific ap-proaches to reduce loadings of pollutants. The study resulted in new knowledge of the relationships between nonpoint source pollution and land use activities in the many watersheds draining to the Great Lakes, the impact of these land use activities upon quality of the receiving waters, the pollutants transported by tributaries, and the impact of the pollutants on the lakes themselves.

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

Statistics on pollutant concentrations in specific areas, land use activities, and estimates of total ollutant concentrations in sediments, are provided. (Majtenyi-IPA)

RESEARCH TO ANTICIPATE ENVIRONMENTAL IMPACTS OF CHANGING RESOURCE

Stanford Research Inst., Menlo Park, CA. For primary bibliographic entry see Field 6G.

OUR RECLAMATION FUTURE: THE MISSING

BET ON TREES, Southern Illinois Univ. at Carbondale, IL. Dept. of Botany. For primary bibliographic entry see Field 4C.

W79-00086

REJECT STREAM REPLACEMENT STUDY. Bureau of Reclamation, Denver, CO. Lower Colorado Region.
For primary bibliographic entry see Field 3A.

W79,00092

SOIL. WATER AND AIR SCIENCES RESEARCH.

Science and Education Administration, Washington, DC.

For primary bibliographic entry see Field 2G. W79-00105

INFLUENCE OF STRIP MINES ON REGIONAL GROUND-WATER FLOW Massachusetts Inst. of Tech., Cambridge. Dept. of

Civil Engineering.
J. L. Wilson, and D. A. Hamilton.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 13988, p 1213-1223, September 1978. 7 fig. 12 ref, 2 append.

Descriptors: *Strip mines, *Base flow, *Groundwater, *Great Plains, *Model studies, Aquifers, Water sources, Water resources, Coal mines, Dewatering, Excavation, Analytical techniques, Finite element analysis, Mathematical models, Numerical analysis, Flow, Groundwater movement, Phreatic lines, Water table.

The effect of an operational strip mine on regional groundwater flow was investigated using a finite element model of the steady flow system. Mine lo cation, mine size, water table configuration, and subsurface layering of aquifer units were examined. The results demonstrated that: (1) The impact of a mine can extend far beyond its radius of influence at the water table: (2) mines placed near regional discharge areas have a more significant effect on the regional system; (3) natural watertable variation due to topography masks the effects of some mines; and (4) buried aquifers beneath the mine excavation limit the amount of flow field distortion caused by the mine. (Humphreys-ISWS) W79-00118

PRELIMINARY IDENTIFICATION OF THE SALT PICK-UP AND TRANSPORT PROCESSES IN THE PRICE RIVER BASIN, UTAH, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 3C. W79-00145

SEA-WATER NEUTRALIZATION OF PROCESSING OF PHOSPHORITE. A CASE
STUDY IN THE PRACTICAL USE OF BASIC KNOWLEDGE IN ANALYTICAL AND MARINE

Chaimers Univ. of Technology, Gotborg (Sweden); and Goteborg Univ. (Sweden). Institutionen for Analytisk Kemi.
D. Dyrssen, and B. Elgquist.
Analytica Chimica Acta, Vol. 100, p 23-29, 1978. 3 fig, 3 tab, 17 ref.

Descriptors: "Fluorides, "Silicon, "Chemical wastes, "Neutralization, "Waste dilution, Sea water, Computer programs, Analhytical techniques, Graphical analysis, Volumetric analysis, Chemical reactions, Chemical properties, Solubility, Phosphorus compounds, Waste water treatment, Byproducts, Industrial wastes.

The HALTAFALL computer program identified the reactions occuring during the neutralization and dilution with sea water of silicon tetrafluoride (SiF4) and hexafluorosilicic acid (H2SiF6); these compounds are byproducts of superphosphate, phosphoric acid, and phosphate production. Previ-ously derived equilibium constants for the complexation of magnesium and calcium with fluoride, acidity constants for carbonate ions in sea water, and disproportionation equilibria for soluble silicon species were selected for the HALTAFALL calculation. The extended calculation. The program was applied to a case in which 270 kg/hr of fluoride as SiF4 were removed with 240 cu m/hr of sea water in a scrubber; 140 kg/hr of F as fluorosilicic acid were added to the effluent and diluted with sea water. Measurements on the sea water included: salinity (18.82 ppt), total alkalinity (0.00195 moles), total calcium (0.006 moles), total magnesium (0.029 moles) and total fluoride (0.00004 moles). The effluent contained 0.0592 moles of fluoride in the form of SiF4, and 0.0307 moles as H2SiF6. Calculated pH curves indicated that neutralization was achieved at a dilu-tion of 1:40-50; the concentrations of silicon complexes decreased rapidly as dilution approached the equivalence value. If the solubility product of calcium and fluoride was greater than the ionic strength of the brackish water, precipitation oc-curred unless the solution was rapidly diluted from 1:25 to 1:200. Predictions by the HALTAFALL program were verified by titration experiments with sea water and the industrial waste stream. (Lisk-FIRL) W79-00151

OIL/WATER SEPARATION TECHNOLOGY: THE OPTIONS AVAILABLE - PART 2. American Cyanamid Co., Stamford, CT R. B. Tabakin, R. Trattner, and P. N. Cheremisinoff.

Water and Sewage Works, Vol. 125, No. 8, p 72-75, August, 1978. 3 fig, 31 ref.

Descriptors: Oily water, *Emulsions, *Oil wastes, *Separation techniques, *Flotation, Centrifugation, Acidity, Coagulation, Salts, Coalescence, Drops(Fluids), Filters, Activated sludge, Trickling filters, Fibrous beds, Carbon filters, Membrane processes, Reverse osmosis, Dispersion, Waste ater treatment, Industrial wastes

Processes and equipment are evaluated for the separation of oil and water from oil refinery ef-fluents. Air flotation can reduce the effluent oil content to 1-20 ppm. In general, air is dissolved in the effluent at 2-3 atm; the pressure is released; and bubbles are formed. Variations of this process include: full-flow operation, in which the entire in-fluent flow is air saturated; split-flow operation, where part of the flow is pressurized and aerated and the rest is diverted directly to the flotation chamber; and recycle operation, in which influent is mixed with re-pressurized, dissolved air-bearing clarified effluent. Centrifugal separators, removing oil in a small column at the vortex, have been found more efficient in separating water-in-oil emulsions, oil-wet solids, and dispersed oil. Of the chemical, physical, and electrical emulsion breaking techniques, chemical treatment is most com-mon. Methods of chemical separation include

acidification, coagulation, salting out, and demulgation with organic demulsifiers; jar testing of demulsifiers is recommended to determine optimum conditions. Coalescence, utilizing fibrous filter media such as nylon, propylene, or fiberglass wrapped around a rigid spool, operates on the principle of gravity settling of large droplets formed from smaller droplets. Biological treatment by trickling filters or activated sludge is only effective for low oil concentrations. Large capital investiments have been associated with carbon adsorption and membrane filtration techniques. (Lisk-Filt.) W79-00158

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OIL-TROUBLED WATER,

Ground Water Consultants, Al-American Ground Water Consultants, buquerque, NM. For primary bibliographic entry see Field 5B. W79-00169

NO WATER-SOURCE DAMAGE FOUND IN OIL The Oil and Gas Journal, Vol. 76, No. 35, p 52, August 28, 1978.

Descriptors: "Oil pollution, "Water pollution control, "Saline water intrusion, Aquifers, Interstate commissions, Chlorides, Correlation analysis,

The Interstate Oil Compact Commission (IOCC) sponsored a study of ground-water contamination by oil and gas operations in five big producing states: Texas, New Mexico, Oklahoma, Louisiana, and Arkansas. The study utilized over 450 monitoring points in major aquifers overlying oil and gas producing reservoirs and covered a 15 year record of well water tests. In four of the states, chloride concentration in the water was monitored and was not found to increase. In Texas, four approaches were made involving the statistical relationship between chloride concentration in ground water and oil production; chloride variation in public water supplies near oil and gas fields, salinity contours for different time periods, and a review of related literature and research. The study concluded that no significant relationship exists between chloride increases in groundwater and oil and gas production, and that regional changes in groundwater quality are as-sociated with natural causes. (Purdin-NWWA)

WHAT'S IN THE WATER, A LOOK AT THE PROPOSED EPA REGULATIONS FOR OR-GANIC CHEMICALS IN PUBLIC WATER SUP-PLIES.

ary bibliographic entry see Field 5F. For primar W79-00179

BIOCENOSIS OF HIGH MOUNTAIN BIOCENOSIS OF A HIGH MOUNTAIN STREAM UNDER THE INFLUENCE OF TOUR-ISM. 1. CHEMISM OF THE RYBI POTOK WATERS AND THE CHLOROPHYLL CON-TENT IN ATTACHED ALGAE AND SESTON IN RELATION TO THE POLLUTION, Polish Academy of Sciences, Krakow. Zaklad Bioloii Wod.

For primary bibliographic entry see Field 5C. W79-00218

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.

Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Manage-

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 180, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/5-78-007, May 1978. 27 p, 2 fig, 4 ref, 4 append. S-801000.

Water Quality Control—Group 5G

Descriptors: *Water quality, *Water quality control, *Water resources, *Information retrieval, *Data collections, *Pennsylvania, Water resources research, Data processing, Information exchange, Water resources development, Interstate, Groundwater, Surface water, Administration, Water pollution control.

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To provide systems which would enhance the speed and precision of decision making in the field of water quality management, the State of Pennsylvania initiated a program of information handling known as WAMIS, or State Water Qualihandling known as WAMIS, or State Water Quality Management Information System. The objectives of the first grant period, beginning January 1, 1969, were to enhance and demonstrate this system which could be made available for use by Federal, other State, and inter-State water pollution control agencies, and to provide a base for a Water Quality Management Data Systems techniques training program for Federal, State, and inter-State water quality management personnel. Part of the proposed system was implemented using standard keypunch card data entry for processing on a UNIVAC (RCA) SPECTRA 70/45 and provided predetermined periodic reporting capability. This portion of the system was reported in EPA publication 600/5-74-022 entitled, 'Demonstration of a State Water Quality Management Information System.' Since then, systems Demonstration of a State Water Quality Management Information System.' Since then, systems concepts, systems design techniques, software and telecommunications capability have experienced marked changes which are reported. Some of the areas of water quality management covered by the WAMIS system are: facility inspections; progress in terms of enforcement, construction, and water quality upgrading; permit processing; identification of problem areas and priorities; determination of specific treatment, research, and hundertay needs. produces; determination of specific treatment, research, and budgetary needs; treatment plant operations; treatment plant operator certification; word processing; ground-and surface water quality; and planning. (See also W77-04021) (Majtenyi-IPA) W79-00222

REMOTE MONITORING OF COAL STRIP

MINE REHABILITATION,
National Aeronautics and Space Administration,
Slidell, L.A. Earth Resources Lab.

J. E. Anderson, and C. E. Tanner. Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 647, Price codes: A04 in paper copy, A01 in microfiche. Report No EPA-600/7-78-149, July 1978. 58 p, 17 fig, 11 tab, 18 ref, 3 append. 68-03-2636.

Descriptors: *Remote sensing, *Aerial photography, *Surveying instruments, *Mapping, *Land reclamation, *Strip mines, *Inter-agency cooperation, Coal mines, Vegetative cover, Water resources, Landsat, Multispectral scanner, Data processing, Data storage and retrieval, Land reclamation, Revegetation.

A cooperative project is being carried out by the A cooperative project is being carried out by the Environmental Protection Agency (EPA) and the National Aeronautics and Space Administration (NASA) to share both hardware and software technology for processing remotely sensed digital data obtained from aircraft or satellites. The project is divided into three phases, the first of which is reported here. During this phase the state-of-the-art technology for processing aircraft-acquired multispectral scanner (MSS) data was transferred to the Environmental Monitoring and Support multispectral scanner (MSS) data was transterred to the Environmental Monitoring and Support Laboratory in Las Vegas, NV. (EMSL-LV). Also, Landsat and aircraft multispectral scanner data and photographic data over coal strip mines in the Western United States were analyzed using basic pattern recognition techniques refined and/or developed at the NASA Earth Resources Laboratory, Slidell, LA (NASA/ERL). The results of the interpretation of aerial photography and the processed aircraft scanner data were compared to identify apparent weak areas in either approach. The chi square test demonstrated that there were

no significant differences between results ob-tained using computer-implemented techniques and those using conventional aerial photo-in-terpretation techniques. Phase II of the project will involve monitoring selected coal strip mines in the West by EMSL-LV and continued research on pattern recognition techniques by ERL. Phase III will include tests of the system in an operational mode by EMSL-LV with continued software development from NASA/ERL. (Majtenyi-IPA) W79-00226

ON THE ENVIRONMENTAL EFFICIENCY OF ECONOMIC SYSTEMS,
Pennsylvania State Univ., University Park.

For primary bibliographic entry see Field 6G. W79-00230

CONCEPTUAL AND STATISTICAL ISSUES IN

DEVELOPING ENVIRONMENTAL MEASURES
- RECENT U.S. EXPERIENCE,
Bureau of Economic Analysis, Washington, DC.
For primary bibliographic entry see Field 6G. W79-00232

WET COOLING TOWER BACKFITTING

ECONOMICS, Iowa Univ., Iowa City. Div. of Energy Engineer-ing; and Iowa Univ., Iowa City. Div. of Research

Engineering. T. E. Croley, II, A. R. Giaquinta, and V. C. Patel. Journal of Power Division, Vol 104, No 2, p 115-130, April 1978. 9 fig, 7 fig. EPA 68-02-0430, USDA 14-31-0001-9015, 14-31-0001-5201.

Descriptors: *Economics, *Analytical techniques, *Cooling towers, *Closed-cycle cooling, *Costs, *Powerplants, Methodology, Computer programs, Open-cycle cooling, Equipment, Federal Water Pollution Control Act Amendments of 1972, Operation and maintenance, Backfitting,

A technique is presented for evaluating the cost of backfitting a power plant or unit currently using open-cycle cooling with a closed-cycle mechanical-draft crossflow wet cooling tower. Many existing steam-electric plants with open-cycle cooling will be required by provisions of the Federal Water Pollution control Act Amendments of 1972 to backfit a closed-cycle system. Major economic factors are: (1) installation cost; (2) additional equipment and design changes in existing equipment; (3) plant downtime for changeover; (4) provision of additional generating capacity to replace power consumed by the closed-cycle system; (5) operation and maintenance costs of cooling towers; (6) operation cost of replacement capacity; and (7) additional cost of power generation due to decrease in plant efficiency. Basic as-sumptions, equations, and background data are presented, and components of capital and operat-ing costs are described. Differential capital and operating costs are combined by the levelized annual cost method to obtain the unit excess costs of energy production resulting from backfitting. The technique is illustrated with a specific unit operat-ing at constant full load, for which cost figures and normalized curves showing the dependence of maximum capacity loss, excess fuel consumption, and evaporative water loss on tower size are given. An analytical computer program is described. (Lynch-Wisconsin) W79-00233

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER, Department of Justice, Washington, DC. Antitrust

For primary bibliographic entry see Field 6B. W79-00234

A SOCIO-ECONOMIC APPROACH TO WATER POLLUTION LAW ENFORCEMENT IN ENGLAND AND WALES, Newcastle-upon-Tyne Univ. (England). Dept. of

Economics.

D. J. Storey.

International Journal of Social Economics, Vol. 4,
No. 3, 1977, p 207-224. 6 tab, 20 ref.

Descriptors: *United Kingdom, *Effluents, *Water pollution control, *Law enforcement, *Pollution taxes(Charges), *Water quality standards, *Regulation, England, Wales, Litigation, Rivers, Costs, Legal aspects, Air pollution, Oil pollution, Economics, Social aspects, Equations, Economic analysis.

The present consent system in the United Kingdom for controlling direct effluent discharges into rivers is compared to an effluent pricing system from the standpoint of law enforcement. It is concluded that it is not possible to determine the relative success of the two policies, because of difficulties in assessing the amount of compliance now achieved through 'arm-twisting'-that is threats of litigation-by river authorities and the Alkali Inspectorate. Current enforcement policy is based on cooperation rather than confrontation. based on cooperation rather than confrontation, with litigation resorted to only after other methods have failed. Empirical data indicate that if firms minimize costs, a barely positive tax level will result in limitation of discharges at the plant level to a quantity about equivalent to those under the conciliatory approach, assuming litigation to be the only enforcement mechanism. Including armtwisting in the evaluation, however, makes judgment difficult. It appears, nevertheless, that few of Stigler's law enforcement agency rule s are followed by environmental agencies in England and Wales; any proposals for establishing a unified inspectorate should be tested against these rules. The system of law enforcement prior to 1974 is outlined, and a comparison is made between en-forcement methods for breaches of air and water llution, and illegal discharges of oil. (Lynchwisconsin)

ECONOMIC ANALYSIS OF SELECTED FEATURES OF MUNICIPAL WASTEWATER CONSTRUCTION GRANT LEGISLATION,

Environmental Research Center, Research Triange Park, NC.
M. Rose, and J. Goldstein.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-276 619, Price codes: A07 in paper copy, A01 in microfiche. Publication No. EPA-600/5-77-011b, August 1977. 137 p. 11 tab. 6 ref.

Descriptors: *Federal Water Pollution Control Act Amendments of 1972, *Federal Construction Grant Program, *Treatment facilities, *Construction costs, *Economic efficiency, *Subsidies, Equity, Economics, Grants, Waste water treatment, Municipal wastes, Cost-sharing, Incentives, Resource allocation, Water pollution control, Legislation, Use rates, Cost-benefit analysis

The Federal Construction Grant Program for sub-sidizing construction of municipal wastewater treatment facilities is evaluated, concentrating on three major aspects: (1) grant formula, (2) allot-ment funding process, and (3) industrial cost recovery. Existing legal provisions are shown to recovery. Existing legal provisions are shown to be ineffective in encouraging cost-effectiveness and in promoting equitable distribution of federal grant funds. Recommended improvements: (1) Provide higher cost-sharing rates and larger fund-ing authorizations for secondary and higher-level treatment projects. (2) Supplement the grant pro-gram with a subsidy based either on operation and maintenance or on degree of abatement achieved to compensate for the absence of effluent charges. (3) Divide grant allotments into two portions, one based on cost-effectiveness of the project, and

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

one based on equity in which a community's pollu-tion control costs are related to fiscal capability. (4) Return cost-recovery funds to the U.S. Treasu-ry or Construction Grant Program for redistribu-tion to highest priority projects, or at a minimum eliminate the local discretionary fund which currently can be used to finance projects unrelated to pollution control. The current grant program favors higher cost projects because it subsidizes only grant-eligible construction costs, and because of cost-recovery provisions relating to industrial use of public facilities. (Lynch-Wisconsin)
W79-00246

COST ESTIMATES FOR CONSTRUCTION OF PUBLICLY-OWNED TREATMENT FACILI-TIES, 1974 'NEEDS' SURVEY, FINAL REPORT TO THE CONCEPSE

TO THE CONGRESS.
Environmental Protection Agency, Washington,
DC. Municipal Construction Div.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 682,
Price codes: A03 in paper copy, A01 in microfiche.
February 1975. 24 p, 4 tab, 2 append.

Descriptors: "Construction costs, "Estimated costs, "Treatment facilities, "Waste water treatment, "Federal Water Pollution Control Act Amendments of 1972, Costs, Sewage treatment, Grants, Subsidies, Surveys, U.S. Environmental Protection. Assert. Recognitive Expressions Protection Agency, Economics, Forecasting, Storm water.

A 1974 state-by-state cost estimate survey for wastewater treatment facilities was conducted by the U.S. Environmental Protection Agency in compliance with the Federal Water Pollution Con-trol Act Amendments of 1972 as further amended by PL 93-243. Estimates obtained were for meetby FL 93-243. Estimates obtained were to the intended as a possible basis for allocation of construction grant funds authorized after 1975. This final report presents cost estimates both as originally received and as corrected to eliminate clerical reporting er-rors. In addition, EPA adjustments are given based on evaluation of technical validity of cost estimates and identification of data anomalies that would treat some states unfairly if the estimates were used in a grant allocation formula. Cost categories with EPA-adjusted figures are: (1) categories with EPA-adjusted figures are: (1) secondary treatment, \$12.6 billion; (2) facilities required by more-stringent water quality standards, \$15.7 billion; (3A) correction of sewer infliration/inflow problems, \$5.3 billion; (3B) major sewer rehabilitation, \$7.3 billion; (4A) collector sewers, \$17.5 billion; (4B) interceptor sewers, \$17.8 billion; (5) correction of combined sewer overflows, \$31.1 billion; and (6) treatment and/or control of stormwaters, \$235 billion. It is recommended that only Categories 1. 2. and 4B be used mended that only Categories 1, 2, and 4B be used for allocation purposes, as the other categories could not be adjusted to correct unevenness in the data. (Lynch-Wisconsin) W79-00248

LABORATORY STUDIES OF GAS TRACERS FOR REAERATION, Geological Survey, Bay St. Louis, MS. Water Resources Div

For primary bibliographic entry see Field 5A. W79-00270

CRITERIA DOCUMENT FOR DDT. Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. For primary bibliographic entry see Field 5A. W79-00276

ON THE VERTICAL DISTRIBUTION AND SEASONAL DEVELOPMENT OF THE DENSITY OF DREISSENA POLYMORPHA LARVAE IN THE PELAGIC ZONE OF THE LAKE OF ZU-RICH (IN GERMAN), Gesundheitsinspektorat (Switzerland). Stadt

For primary bibliographic entry see Field 5F. W79-00280

Environmental Protection Agency, Washington, DC. Office of Water Planning and Standards. For primary bibliographic entry see Field 5A. W79-00281

CRITERIA DE DOCUMENTS DC. Office of Water Planning and Standards.
For primary bibliographic entry see Field 5A. W79-00282

ASSESSMENT OF THE ENVIRONMENTAL IM-PACTS ON THE BAN ON IMPORTS OF PCBS, Versar, Inc., Springfield, VA. R. P. Burruss, Jr. Available from the National Technical Informa-

tion Service, Springfield, VA 22161 as PB-270 225, Price codes: A08 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA 560/6-77-007, July 1977. 164 p, 5 fig, 12 tab, 3 app,

Descriptors: *Polychlorinated biphenyls, Import, Economics, Foreign trade, Path of pollutants, Mineral industry, Mining, Chemical wastes, Equipment, Industries, Water pollution sources, Organic compounds, Aroclors, *Water quality standards, *Polychlorinated terphenyls, standards, *Poly
*Industrial chemicals.

This report summarizes an investigation into the uses of imported polychlorinated biphenyls (PCBs) in the United States. Imported PCBs are presently used only for the maintenance of certain presently used only for the maintenance of certain mining machinery. In addition, PCBs are present as a significant impurity in polychlorinated terphenyls (PCTs) imported for use in investiment casting waxes. Importation of PCBs for these uses will be banned after 1977 by the Toxic Substances. Control Act, unless exemptions are allowed in ac-cordance with the provisions of the Act. The recent Directive of the Council of the European Communities (EEC) prohibits use of PCBs and PCTs in investment casting waxes, but allows con-tinued use of PCBs in mining machinery in Europe. (EIS-Deal) W79-00290

VEGETATIVE STABILIZATION OF DREDGE SPOIL IN NORTH FLORIDA, Florida A and M Univ., Tallahasse C. L. Coultas, G. A. Breitenbeck, W. L. Kruczynski, and C. B. Subrahmanyam. Journal of Soil and Water Conservation, Vol. 33, No. 4, p 183-185, July-August 1978. 2 fig, 2 tab, 15 ref. Coop. St. Res. Serv. 516-15-27.

Descriptors: *Dredging, *Grasses, *Florida, Vegetation, Vegetation establishment, Estuarine environment, Coastal marshes, Coastal engineering, Estuaries, Fertilizers, *Dredge spoil, *Vegetation stabilization, Panic grass, Needlerush, Cordgrass, Saltgrass, Sandy spoil,

A North Florida estuary was the site for planting a sandy dredge spoil with panic grass, sea oats, and American beachgrass supertidaly, and needlerush. cordgrass, and saltgrass intertidally. Supertidal plants were fertilized at rates of 0, 100, and 200 pounds per acre with 10-10-10 fertilizer twice dur-ing the growing season. E-12 the growing season. Fertilization increased ing the growing season. Fertilization increased total biomass of panie grass and height of sea oats. The 200-pound rate increased growth of beachgrass roots and rhizomes. Fertilization also increased the nitrogen, phosphorus, and potassium concentrations in some plants. Survival was poor among plants in the intertidal zone, probably because of the stress created by current and waves. (Roberts-ISWS) W79-00337

THE BIOLOGICAL EFFECTS OF TOXIC MATERIAL SPILLS, Environmental Protection Agency, Edison, NJ. For primary bibliographic entry see Field SC. W79-00344

SAFETY ASPECTS HAZARDOUS SPILLS, OF TOXIC AND Wood (William S.) and Associates, West Chester, L/Ni tio

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Available from Copyright Clearance Center, Inc.,
New York, NY as 0065-8812-78-9831-0178 (\$0.75).
In: Water -- 1977, AIChE Symposium Series, Vol.
74, No. 178, edited by G. F. Bennett, p 11-14, 1978.

Descriptors: *Safety, *Accidents, *Water pollu-tion effects, *Toxicity, Safety factors, Chemicals, Corrosion control, Control system, Explosions, Burning, CHEMTREC, Hazards, Spills.

Spills of toxic substances which can occur through transportation accidents or various mechanical failures can have a variety of effects depending on the nature of the material spilled and where the ac-cident occurs. Injuries can be incurred through direct contact with materials, such as corrosive chemicals or toxic fumes, and indirectly, through explosions and fires caused by ignition of flammaexplosions and fires caused by ignition of flammable materials. The best control measures are improved design and adequate emergency planning. An example of an emergency assistance plan is CHEMTREC, operated since 1971 by the Manufacturing Chemists Association, Washington, D.C. CHEMTREC maintains a telephone service available to police and firefighters all over the country to supply vital information on bandling dangerous spills. Several other programs and publications related to safety and handling of toxic spills are noted, including: Loss Prevention Symposia, held by AIChE, the 'Emergency Action Guide' published in 1976 by the U.S. Department of Transportation, and a training course for emergency services being developed by the National Fire Protection Association which was to be completed in November 1977. (See also W79-00342) (Majtenyi-IPA)

MANAGEMENT PLAN FOR CONTROL AND TREATMENT OF TOXIC SUBSTANCES, Research Corp. of New England, Wethersfield,

Available from Copyright Clearance Center, Inc., New York, NY as 0065-8812-78-9874-0178 (\$0.95). In: Water – 1977, AICHE Symposium Series, Vol. 74, No. 178, edited by G. F. Bennett, p 15-22, 1978, 4 fig, 13 ref.

Descriptors: "Safety, "Accidents, "Management, "Control, "Toxicity, Industrial plants, Methodology, Planning, Hazards, CHEMTREC, OHMTADS, Control systems, Regulation, Pollution, Chemicals, Spills.

In view of government plans to increase regulation over handling of toxic substances, companies in-volved in this area must develop programs for con-trol of such materials. The first step towards an effective management plan is learning applicable regulations and determining how they affect the particular installation. Next, an appropriate plan can be made and implemented. Factors to be considered are: potential sources of trouble, backup systems, containment procedures in case of ac-cident, and detection monitors. An inventory of resources available to the plant is recommended and outside hotline information systems should be investigated, such as CHEMTREC, run by the Manufacturing Chemists Association and OHMTADS, a computerized information system on hazardous material run by the Environmental Pro-

Techniques Of Planning—Group 6A

tection Agency. Specific methods are noted for handling spills on land and in water. For instance, materials like polyurethane foams and silica gels are used to contain toxic spills on land and insoluble toxic substances can be filtered or screened. (See also W79-00342) (Majtenyi-IPA) W79-00346

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Series, Vol. 15-22, 1978,

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n system on nmental ProLAKE SUPERIOR REGULATION EFFECTS, National Oceanic and Atmospheric Administration, Ann Arbor, MI. Great Lakes Environmental Research Lab. For primary bibliographic entry see Field 4C. W79-00388

A STUDY OF COASTAL POLLUTION AND AGENCY INTERFACE, University of Southern Mississippi, Hattiesburg. Coll. of Business Administration.
C. P. Cartee, and D. C. Williams, Jr. Water Resources Bulletin, Vol. 14, No. 5, p 1167-1175. October 1978.

Descriptors: "Water pollution, "Coasts, "Agency-government interface, Regulation, Mississippi, Municipal governments, Board of Health, Air pollution.

The 26-mile man-made beach bordering part of Mississippi's Gulf Coast and the contiguous Mississippi Sound waters provide an important recreational and tourist attraction for that area. Being the tourist nucleus for the State, announcements in September 1973 by the Mississippi Air and Water Pollution Control Commission and the State Board of Health that Sound waters had reached a level of pollution that made them potentially dangerous for body contact was met with a myriad of responses. The resulting multigovernmental, multi-agency interface that resulted in trying to deal with the situation highlighted the type of problems that can arise when social, economic, political, and legal forces come to bear on a sensitive area. Questions of jurisdictional and legal authority to act, tourist industry economic pressures, and water quality testing and monitoring procedures were representative of the type of problems of articulation that it is essential between federal, state, and local agencies vested with responsibilities, such as monitoring water quality and protecting public health. This paper develops some of the interface complexities that emerged in dealing with this problem and makes selected recommendations for other areas that may potentially face similar situations. (Bell-Cornell)

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTATION REPORT,

TION REPORT, Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00398

EPA'S GOAL FOR SUSPENDED SOLIDS IS NOT MET WITH MEDIA FILTRATION, Procter and Gamble Co., Cincinnati, OH. For primary bibliographic entry see Field 5D. W79-00414

AQUATIC INHABITANTS OF A MINE WASTE STREAM IN ARIZONA, Arizona State Univ., Tempe. Dept. of Zoology. For primary bibliographic entry see Field 5C. W79-00426

REGIONALIZATION OF STORMWATER RESPONSE FOR THE TENNESSEE VALLEY USING THE LAG MODULUS CONCEPT, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
D. J. Jessup.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 138, Price codes: A06 in paper copy, A01 in microfiche. M.S. Thesis, June, 1977. 94 p. 37 fig, 14 tab, 24 ref, append. OWRT A-046-TENN(2), 14-34-0001-7090.

Descriptors: *Stormwater, *Storm runoff, *Rainfall-runoff relationship, Hydrologic data, *Tennessee Valley, *Regional analysis, Urbanization, Runoff, Hydrographs.

Stormwater response was regionalized using hydrologic data from 17 urban and rural basins (0.24 to 117 sq. mi.). Lag time, the difference between 50% of runoff and rainfall excess volumes, is related to lag modulus (constant for a given land use) and the weighted rain excess intensity for the storm to the -0.4 power. This relation was derived from kinematic wave theory. Lag times were computed from optimized response functions associated with the TVA Stormwater (Double-Triangle) Model. Lag modulus was regionalized in terms of 8 significant watershed characteristics using principal components regression. The regionalization model facilitate simulation of the effects of stormwater response associated with urbanization.

A PILOT PLANT TRIAL FOR OZONE STERILIZATION OF FISH HATCHERY WATER

Idaho Univ., Moscow.

T. J. Morrison.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 045, Price codes: A06 in paper copy, A01 in microfiche.

M.S. Thesis, October 1977. 113 p, 33 fig, 11 tab, 20 ref, 6 append. OWRT A-053-IDA(2), 14-34-0001-6013.

Descriptors: Fish, *Fish hatcheries, *Fish diseases, *Ozone, Ammonia, Nitrates, Water chemistry, Nitrification, Water quality, Disinfection, Waste water treatment, Water pollution treatment

An ozone pilot plant was installed at the Dworshak National Fish Hatchery to examine the efficacy of sterilizing makeup water entering this recycle hatchery. The pilot plant actually consisted of two separate systems operated together. A recycle system consisting of two fish tanks, a clarifier and biofilter was in operation prior to this study. An ozone system consisting of a Grace ozone generator (later replaced by a Welsback generator) and a Grace contacting column was installed for this study. The ozone pilot plant supplied the makeup water to the existing recycle system. The pilot plant was run with approximately 125 pounds of cutthroat and one-half pound of steelhead fry. Recycle rate was 30 GPM and makeup rate was 3 GPM. At the conclusion of the pilot plant study, an economic comparison was made of an ozone system and an ultraviolet system. The basis for comparison was a proposed 650 GPM system to be installed at Dworshak. Although the ozone treatment system requires a capital investment of \$154,000 as opposed to \$90,000 for an equivalent size ulraviolet system and an annual cost of almost \$17,000 as opposed to \$12,000 for the UV system, this study demonstrates the increased cost may be justified. The ozone system gave consistently greater sterilization efficiency than the ultraviolet system. It also showed consistently lower ammonia level and more uniform BOD concentrations. All of these effects would enhance fish survival.

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES, New Hampshire Univ., Durham. For primary bibliographic entry see Field 4C. W79-00460

SEEPAGE CONTROL BY PARTICLE SIZE SELECTION, Science and Education Administration, Temple, TX. Grassland-Forage Research Center. For primary bibliographic entry see Field 4A. W79-00484

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

WASOPT USERS MANUAL: AN INTEGER PROGRAMMING METHODOLOGY FOR MUNICIPAL/REGIONAL WATER SUPPLY PLANNING, Utah Water Research Lab., Logan. T. C. Hughes, P. E. Pugner, and G. Clyde.

PLANNING, Utah Water Research Lab., Logan. T. C. Hughes, P. E. Pugner, and G. Clyde. Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 575, Price codes: A06 in paper copy, A01 in microfiche. Publication PRWG198-2, December 1977. 102 p, 17 fig., 2 tab. 5 append. OWRT B-145-UTAH(2). 14-34-0001-7132.

Descriptors: "Systems analysis, "Methodology, Water supply facilities, "Mathematical models, Model studies, Regional analysis, Planning, Optimization, Cities, City planning, "WASOPT methodology.

A systems analysis methodology is presented for identifying the least cost combination of municipal water supply facilities and operating rules. The planning package called WASOPT (Water Supply Optimization) includes the following procedures and capabilities: (1) The water supply and demand data (both existing and potential) are input in response to interactive statements from the computer in a form similar to that required for a manual solution to the planning problems; (2) WASOPT generates a mathematical model representing the problem's objective and constraints as defined by the input data; (3) the optimal solution is determined by use of a mixed integer programming algorithm; (4) the mixed integer programming solution is reported in a format designed especially for the municipal problem (in addition to the normal optimization package output). The procedure can be applied to regional or single complex municipal problems without revision to the generalized model form. The internal generation of the mathematical model totally eliminates the time consuming and error prone task of manually developing the model constraints and also allows use by planning engineers who have no previous knowledge of computer science or mathematical programing.

SHORTEST PATH PROBLEMS IN HYDROGEOLOGY,
Food and Agricultural Organization of the United

Food and Agricultural Organization of the United Nations, Rome (Italy). Land and Water Development Div. R. G. Thomas.

Ground Water, Vol. 16, No. 5, p 334-340, September-October 1978. 3 fig, 7 tab, 10 ref.

Descriptors: *Scheduling, *Hydrogeology, *Optimization, Operations research, Management, Networks, Planning, Groundwater, Theoretical analysis, *Shortest path, *Minimal spanning tree.

Many aspects of groundwater involve shortest path between two points and shortest round trips to many points. These problems are included in network theory, which is not easily available to groundwater specialists. This paper introduced some of the techniques which can be solved by hand for fairly small projects. Larger networks often can be divided into districts, each of which may then be amenable to hand solution. The

Field 6—WATER RESOURCES PLANNING

Group 6A-Techniques Of Planning

minimal spanning tree problem was described as background to the more useful problem of shortest path between two particular nodes. The matrix method is the simplest solution for the shortest path between all pairs of nodes and can easily be solved by hand for 30 or less nodes. This data can be used to determine which node is most centrally located and to determine a shorter round trip from one node to all others, returning to the origin. The matrix can be used for partial routes and for routing of two or more vehicles. (Visocky-ISWS) W79-00137

CONJUNCTIVE USE OF GROUND AND SUR-FACE WATER, Infotech, Tehran (Iran). For primary bibliographic entry see Field 4B. W79-00170

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL, AP-

PENDIX A, Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00188

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL, APPENDIX

Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00189

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY. APPENDIX

Battelle Pacific Northwest Lab., Richland, WA. For primary bibliographic entry see Field 5B. W79-00190

MODELING FOR ORGANIZATIONAL DECI-SION-MAKING: SION-MAKING: PROFITS VS. SO VALUES IN RESOURCE MANAGEMENT, SOCIAL State Univ. of New York at Albany. School of

H. Kahalas, and D. L. Groves Journal of Environmental Management, Vol. 6, No. 1, January 1978, p 73-84. 2 tab, 11 ref.

Descriptors: *Model studies, *Decision making, "Multiple purpose, "Forest management, "Goal programming, "Watershed management, "Analytical techniques, "Social values, "Alternative planning, Profit, Natural resources, Economics, Forestry, Social aspects, Forests, Recreation, Forest watersheds, Goals, Priorities,

A goal programming model is developed for multiple-use forest usage as a component of watershed management. The model is initially examined from an industrial perspective, then the priority struc-ture is modified to coincide with societal forest use goals. Goal programming is superior to linear programming in forestry management in that it can handle conflicting goals ghrough the priority system and allow attainment of a solution by inimizing deviations from each specified goal All constraints are treated as goals with associated priorities, so that values assumed by the deviational variables of each constraint determine the extent of goal achievement. Prioritized five-year industrial goals of a timbering company in the example are: (1) at lest \$10,000 total profit, (2) at least 5% annual growth in net worth, (3) at least \$3000 in dividends/yr, (4) watershed management on at least 200 acres/yr, (5) at least 150 wilderness acres reserve, and (6) at least 1000 acres provided for recreation. The company owns 3260 acres of forest land. In the first computer run all but goal (5) were at least partially attained. As revised according to social values, the priority ranking is: (1) watershed management, (2) wilderness preserve, (3) recreation, (4) profit, (5) net worth, and (6) dividends. In the new computer run, all but goal (6) are at least partially achieved. Incorporation by industry of societal goals is likely to have positive benefits for the company. (Lynch-Wisconsin) W79-00243

MODELLING THE WATER QUALITY OF THE HYDROLOGICAL CYCLE. For primary bibliographic entry see Field 5B. W79-00379

STOCHASTIC PROCESSES RESOURCES ENGINEERING. STOCHASTIC IN WATER Lund Inst. of Tech. (Sweden). Dept. of Water Resources Engineering.
For primary bibliographic entry see Field 8B.
W79-00380

STORMWATER MODELING, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.
W79-00381

LAKE SUPERIOR REGULATION EFFECTS, National Oceanic and Atmospheric Administra-tion, Ann Arbor, MI. Great Lakes Environmental Research Lab For primary bibliographic entry see Field 4C. W79-00388

LAKE LEVEL CONTROL AND MANAGE-MENT-A CASE STUDY, Barr Engineering Co., Minneapolis, MN. For primary bibliographic entry see Field 4A. W79-00390

OPTIMAL OPERATION OF SHELBYVILLE AND CARLYLE LAKES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 4A. W79-00392

APPLICATION OF LINEAR PRO-GRAMMING TO RUN-OFF MANAGEMENT, National Inst. of Agricultural Engineering, Silsoe (England).

For primary bibliographic entry see Field 4A. W79-00393

DYNAMIC PROGRAMMING AND THE PRIN-CIPLE OF OPTIMALITY: A SYSTEMATIC AP-PROACH Princeton Univ., NJ. Dept. of Civil Engineering.

M. Sniedovich Advances in Water Resources, Vol 1, No 4, p 183-190, June 1978. 20 ref.

Descriptors: Water resources, *Dynamic programming, *Optimization, *Bellman's principle, Decision making, Equations, Mathematical models, Management, Systems analysis.

The dynamic programming recursive procedure has provided an efficient method for solving a variety of sequential decision problems related to water resources systems. In many investigations Bellman's principle of optimality is used as a proof for the optimality of the dynamic programming (DP) solutions. Herein, the dynamic programming (DF) solutions. Herein, the dynamic programming procedure is systematically studied so as to clarify the relationship between Bellman's optimality principle and the optimality of the DP solutions. The main result is that, although the principle is valid, in order to use it as a proof for the optimality of the DP solution. of the DP solution, certain modeling requirements must be met. The model presented herein provides convenient framework for the analysis of DP problems encountered in water resources manage-

ment studies. The results derived resolve few of the fundamental questions raised in the literature regarding the validity of Bellman's principle of op-timality and the optimality of the dynamic pro-gramming solutions. (Bell-Cornell) W79-00396

A WATER QUALITY MODEL FOR THE SOUTH PLATTE RIVER BASIN, DOCUMENTA-TION REPORT, Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00398

OPTIMAL SOLUTION TO THE TIMING, SEQUENCING, AND SIZING OF MULTIPLE RESERVOIR SURFACE WATER SUPPLY FACILITIES WHEN DEMAND DEPENDS ON PRICE, California Univ., Los Angeles.

N. Y. Moore

Available from the National Technical Informa-Avanable from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 155, Price codes: A07 in paper copy, A01 in microfiche. Ph.D Dissertation, June 1977. 128 p, 12 fig, 6 tab, 55 ref, 2 append. OWRT C-5184(No 4208)(5), 14-31-0001-4208.

Descriptors: *Model studies. *Water resources development, *Optimum development plans,
*Planning, *River basin development, *Reservoir yield, Economic efficiency, Operations research, Dynamic programming, Water supply, Water demand, Welfare(Economics), Econometrics, Pricing, Computer programs, Optimal timing, Demand

A general multi-period planning model for the op-timal timing, sizing, and sequencing of reservoir additions to surface water supply is presented. The objective of the model is the maximization of net economic efficiency benefits subject to hydrologic system constraints. The model is designed to handle system increments which are unique and interdependent. Since firm water, the product of the system, is dependent on existing reservoir sizes, configurations, and hydrologies a rational operating scheme is incorporated into to the optimiza-tion. A price-sensitive demand curve which changes according to a prescribed growth rate is used. Firm water demand is thus sensitive to changes in price and time as opposed to most fixed demand requirement approaches. Benefits are measured by the willingness-to-pay encept. Known reservoir cost relationships which are a function of project capacity determine cost relationships which are a function of project capacity detemine costs. A forward dynamic programming algorithm is used for solution. The model is tested with an application to the Eel River Project in Northern California. The discount rate, growth rate, and demand elasticity are parameterized and tested over several values. (Yeh-Calif) W79-00438

A MODEL FOR EVALUATING THE EFFECT OF LAND USES ON FLOOD FLOWS, Virginia Polytechnic Institute and State University, Blacksburg, VA. Agricultural Engineering Department. For primary bibliographic entry see Field 4C. W79-00450

OPERATING MODEL FOR THE GREEN RIVER BASIN RESERVOIR SYSTEM, Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-00452

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rve which WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA, Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineer-

For primary bibliographic entry see Field 6D. W79-00007

A COMPARATIVE STUDY OF COMMUNITY RESPONSE TO WATER RELATED PROBLEMS,

PROBLEMS,
Delaware Univ., Newark. Dept. of Sociology.
D. Wenger, and T. Leitko.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 688,
Price codes: A05 in paper copy, A01 in microfiche.
Completion Report, December 22, 1977. 85 p. 26
tab, 30 ref. OWRT A-031-DEL(2). 14-34-00016008.

Descriptors: Social aspects, *Social change, *Urban sociology, *Decision-making, *Water resources, Development, *Community development, *Attitudes, *Community power.

This study examines the nature of local power ac-tors' definitions, perceptions, and proposals for solving water resource and general community problems. The responses of power actors in six communities in Delaware are compared with those from power actors in ten midwestern communifrom power actors in ten midwestern communi-ties. In general the findings from Delaware tend to support the prior midwestern research. In both settings while local leaders are aware of local water resource problems, these are not important, salient concerns to them. In Delaware water salient concerns to them. In Delaware water resource problems are viewed as being less serious than was the case in the midwest. In both settings, however, there is little consensus among local leaders concerning the severity of local water resource and general problems. Also, there is a lack of faith in the local communities' ability to solve water resource problems by themselves. However, overall the level of inactivity with respect to water resource problem is perceived to be less in Delaware than in the midwest. Furthermore, the power actors in Delaware generally held positive or neutral attitudes toward the helpfulness and effectiveness of state, county, and federal agencies with respect to water resource planning. In addition, a comparison was made of community In addition, a comparison was made of community residents perception of problems with those of local power actors in Delaware. As compared to the power actors, local residents are more likely to perceive the existence of water resource problems, are less likely to see the local communily as being able to solve them, and are less likely to perceive any local activity to solve them. Finally, residents in Delaware perceive protest activities as being the most effective devices for having their political demands met. W79-00010

PROTECTION OF OUTDOOR RECREATION VALUES OF RIVERS.

Washington, DC.

1978 Nationwide Outdoor Recreation Plan, Task

Force Report. 39 p, 4 append.

Descriptors: *River protection, *Recreation, *Wild rivers, *Conservation, *Wild River Act, Scenery, Suwannee River, Housatonic River, River conservation, Georgia, Florida, Connecticut, Massachusetts, Environment, Ecology, Wild and Scenic Rivers System, River regulation, Rivers, Interstate rivers, Federal Government,

Issues surrounding river protection in America are examined and action alternatives for resolution of these issues are proposed. Four major issues are identified: (1) protection of rivers is viewed as the

exception rather than the rule; (2) there is no national focus on recreation and urban rivers; (3) wild and scenic river protection has been slow, costly, and inadequate; and (4) Federal leadership and coordination is inadequate. A number of options for Federal action are proposed. Among the legislative options are: authorization of a River Conservation Revolving Fund to be administered by the Secretary of the Interior; and amendment of the Wild and Scenic Rivers Act to provide financial assistance to States to administer nationally designated rivers. Other options relate to possible executive action directing all Federal agencies to give special recognition and protection to designated wild and scenic river areas, including studies on those areas considered potential additions to the National Wild and Scenic Rivers System. In addition, 14 specific suggestions for agency actions are made for improving and strengthening river protection and conservation. Case studies on the Suwannee River in Georgia and Florida and the Housatonic River in Connecticut and Massachusetts are provided. (Majtenyiticut and Massachusetts are provided. (Majtenyi-W79-00093

PUBLIC OUTDOOR RECREATION BENEFITS OF FEDERAL WATER RESOURCE PROJECTS. Heritage Conservation and Recreation Service, Washington, DC.

For primary bibliographic entry see Field 6E. W79-00094

FEDERAL OUTDOOR RECREATION LAND

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF. Heritage Conservation and Recreation Service, Washington, DC. For primary bibliographic entry see Field 6E. W79-00095

ENERGY CONSERVATION AND OUTDOOR

RECREATION,
Heritage Conservation and Recreation Service,
Washington, DC. For primary bibliographic entry see Field 6G.

NEEDS OF PRIVATE FOR PROFIT ENTER-PRISES IN OUTDOOR RECREATION.
Heritage Conservation and Recreation Service,

Washington, DC. 1978 Nationwide Outdoor Recreation Plan, Task Force Report. 55 p.

Descriptors: *Recreation, *Private recreational industry, *Recreation demand, Recreation facilities, Private concessions, National parks, Parks, Energy consumption, Legislation, Land management.

With continued public demand for greater recreational opportunities, the private sector is demonstrating its competence to provide clean, wholesome and innovative recreation. This creates jobs, incomes and tax revenues; however, Federal agencies are limiting and sometimes even prohibit-ing activities of the private sector. New Federal policy is needed to ensure that Federal recreation policy is needed to ensure that rectain rectains and tourism agencies clear with private sector before purchasing and developing land, and existing policies need to be revised to permit greater support and participation by the private sector on presently-owned and managed Federal recreation lands. Problems and liabilities facing private sector business in the recreation and sports area are described along with current efforts to resolve these issues. Such problems include costs of insurance, regulatory confusion and over-regulation by government, and difficulties involved with private concessions operating on public lands. In each case the discussion includes a statement of issue, background, and a description of current ef-forts to resolve the problem. Other issues discussed are: highway signs, technical assistance and education to aid private sector decision

makers, energy management, nationwide outdoor recreation policy development and the role of the private sector in forming it. (Majtenyi-IPA) W79-0009

ROLES/FUNCTIONS OF FEDERAL, STATE AND LOCAL PUBLIC AGENCIES.

AND LOCAL PUBLIC AGENCIES.
Heritage Conservation and Recreation Service,
Washington, DC.
For primary bibliographic entry see Field 6E.
W79-00098

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY, Kentucky Water Resources Research Inst., Lex-

ington.

W. F. Schweri, II, and J. Van Willigen.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 624, Price codes: A07 in paper copy, A01 in microfiche. Research Report No. 110, June 1978. 142 p, 72 ref. OWRT A-063-KY(1), 14-34-0001-6018; 7037 and

Descriptors: Social Aspects, *Social impact, Decision making, Leadership, Resistance, Resistance networks, *Social values, *Kentucky, Reservoirs, Environmental effects, *Pre-impoundment, Organized resistance, Voluntary association, Socialcost, Sentiment systems.

This is a case study of a group organized to resist the construction of an Army Corps of Engineers reservoir project located in Eastern Kentucky. reservoir project located in Eastern Kentucky. The account describes how a group of landowners organized and enacted an increasingly complex strategy of resistance. Within this framework perceived costs, leadership and authority and group organization are considered. The primary research method employed was that of repeated interviews with members of the resistance organization who were identified as key informants. These inter-views were carried out on both structured and unstructured bases. The formal analysis of the volun-tary association data emphasized the process of resistance. That is, the report depects the evolution of persisting resistance oranization. The con-clusions include recommendations to both project resisters and project planners. (Huffsey-Kentucky) W79-00142

ON THE ENVIRONMENTAL EFFICIENCY OF

Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 6G. W79-00230

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION MANAGEMENT: DISCUSSION, FISHERIES

National Marine Fisheries Service, Seattle, WA. Northwest and Alaska Fisheries Center.

American Journal of Agricultural Economics, Vol 59, No 5, p 885-886, December 1977. 1 ref.

Descriptors: *Fisheries, *Fish management, *Commercial fishing, *Economics, *Jurisdiction, *Welfare(Economics), Model studies, Research priorities, Fish conservation, Institutional con-straints, Regulation, Economic efficiency, Fishery Conservation and Management Act of 1976, Theoretical analysis, Political constraints.

This critique of Huppert's 1977 paper agrees with the author's list of constraints to welfare gains in U.S. fisheries management but adds: (1) knowledge deficiencies associated with both anowing detrements associated with boilogical and economic fishery systems, and (2) cost of instituting and enforcing regulatory programs. Development of more refined and realistic empirical bioeconomic models would facilitate

FIALL 6-WATER RESOURCES PLANNING

Group 6B—Evaluation Process

enactment of regulations by the councils designed enactment of regulations by the councils designed to promote sound fishery operations. However, data inadequacy coupled with data acquisition costs hinders development of such models. Data is needed on salinity, temperature, prevailing currents, and number and feeding habits of stock as well as other fish species. Deficiencies also exist in the economic data base, including recreational use of fish, nature of food fish consumption, substitutability among species by consumers, restaurant consumption, foreign fish markets, competition in the processing sector and its capacity and costs, harvesting costs and capacity, and fishing effort. Costs associated with implementation and enforcement depend upon the nature of the regulatory measures selected. Enforcement costs for programs requiring either aerial or ship surveillance will be high. (Lynch-Wisconsin) W79-00231

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER. Department of Justice, Washington, DC. Antitrust

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National Tax Journal, Vol 30, No 2, p 183-194, June 1977, 5 tah.

Descriptors: *Charles(MA), *Water quality control, *Boston(MA), *Surveys, *Attitudes, *Willingness to pay, Cost-benefit analysis, Mas sachusetts, Social values, Regression analysis, Cities, Swimming, Economics, Rivers.

Costs and benefits were judged about equal in the case of swimmable water in the Charles River, according to a willingness-to-pay survey of 165 families in metropolitan Boston. Determinants of willingness to pay were isolated using regression analysis, and an estimate of aggregate benefit from improving water quality was developed from the regressions and compared to resource costs. The estimated range of aggregate benefits is \$8.8-21.9 million, an average of \$15.4 million, while esti-mated aggregate costs are \$16.7 million. Interviews and questionnaires were administered September-November 1973. Family income, education, proximity of home and workplace to the river, gra student status, and probability of future residence were all positively correlated with willingness to pay. Residence in the region as a percentage of age, percent of past life in the area and age alone were inversely related to willingness to pay, and ownership produced mixed results. Independent variables considered in the analysis were: (1) discretionary permanent family income, (2) graduate student status, (3) age of respondent, (4) comple tion of high school, (5) completion of college, (6) residence distance from the river, (7) percent of family working or attending school near the river, (8) product of ownership and variable 9, (9) probability of future residence in the area, (10) percent of past life in the area, (11) hrs of family river recreation, and (12) swimming ability. (Lynch-Wisconsin) W79-00234

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT: DISCUSSION (ANDERSON), Delaware Univ., Newark. Dept of Economics. For primary bibliographic entry see Field 6E.

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POL-ICY AND RESEARCH ISSUES IN THE FISHERY, Wisconsin Univ.-Madison, Dept. of Agricultural

Economics.

For primary bibliographic entry see Field 6E. W79-00236

DISTRIBUTIONAL IMPLICATIONS OF EX-TENDED FISHERIES JURISDICTION: SOME RESEARCH AND POLICY ISSUES: DISCUS-

Rhode Island Univ., Kingston, Dept. of Resource For primary bibliographic entry see Field 6E. W79-00237

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POLICY AND RESEARCH ISSUES IN THE FISHERY: DISCUSSION, Oregon State Univ., Corvallis. Dept. of Agricultural and Presenting Francisco.

tural and Resource Economics.
For primary bibliographic entry see Field 6E.
W79-00238

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION

EXTENDED JURISDICTION FISHERIE: MANAGEMENT, National Marine Fisheries Service, La Jolla, CA. For primary bibliographic entry see Field 6E.

NATURAL RESOURCE ECONOMICS: THE UP-SETTING DISCIPLINE, Arizona Univ., Tucson, Dept. of Agricultural

M. M. Kelso

American Journal of Agricultural Economics, Vol. 59, No. 5, December 1977, p 814-823. 15 ref.

Descriptors: *Natural resource Descriptors: "Natural resource cconomics, "Economics, "Evivronmental economics, "Agricultural economics, "Theoretical analysis, "Socioeconomic theory, Public lands, Australia, Nauru Island, Goals, Land values, Value, Land economics, Land use, Output, Maximization.

This paper, the test of a lecture, describes the author's efforts during his academic career to rationalize natural resource economics (formerly land economics) with conventional economic theory, particularly agricultural economics. The basic conflict is seen as a question of goals; the goal of standard economics is output maximization within constant external variables of preferences and institutions, taken from a short-run perspective, which is replaced in natural resource economics with the goal of maintaining or improv-or capital stock and the bodies and minds of the aggregate system in a long-run or even infinite time span, and in a closed system. Boulding's 1966 paper on earth viewed as a spaceship rather than as a limitless plain pointed the direction that resolution of the paradox of natural resource economics must take. This vision requires traumatic adjustment of ethical, religious, cultural, and intellectual systems. The problem of public lands is also discussed, here portrayed as a conflict of landlord-tenant relationships versus private thet of landlord-tenant relationships versus private ownership of those lands. Whereas a rancher can correctly be visualized as a private firm, the structure, role, and behavior of a public landlord has never been resolved. The issue of aggregate agricultural land values is discussed, with examples from Australia and Nauru Island in the southwest Pacific Ocean. (Lynch-Wisconsin) W79-00742

MODELING FOR ORGANIZATIONAL DECI-SION-MAKING: PROFITS VS. S VALUES IN RESOURCE MANAGEMENT SOCIAL State Univ. of New York at Albany. School of For primary bibliographic entry see Field 6A. W79-00243

LAND PRICES SUBSTANTIALLY UNDERESTI-MATE THE VALUE OF ENVIRONMENTAL QUALITY. For primary bibliographic entry see Field 6C. W79-00244

THE NATIONAL WATER COMMISSION THE NATIONAL WATER COMMISSION REVISITED PERSPECTIVE ON NATIONAL WATER POLICY STUDIES, WITH SOME IMPLICATIONS FOR CHANGES IN FUTURE WATER POLICY, National Research Council, Washington, DC.

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Commission on Natural Resources. For primary bibliographic entry see Field 6E.

-00383

BRUSHLAND WATERSHED FIRE MANAGE-MENT POLICY IN SOUTHERN CALIFORNIA: BIOSOCIAL CONSIDERATIONS. California Univ., Berkeley. Dept. of Forestry and

California Univ., Berkeley. Dept. of Forestry and Conservation.
R. G. Lee, and T. M. Bonnicksen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 523, Price codes: A05 in paper copy, A01 in microfiche. Technical Completion Report Contribution No. 172, ISSN 0575-4941, August 1978, 74 p. (California Water Resources Center Project UCAL-WRC-W-499). OWRT-A-058-CAL(1).

Descriptors: *Brushlands, *Watershed management, *Forest fires, Political aspects, History, *California(Southern).

Results from the Cleveland National Forest and Angeles National Forest case studies are sum-marized as three interpretations of brushland watershed fire management policy. A historical description of fire exclusion shows the influence of flood control and water related interest groups of flood control and water leaded interest groups in shaping current policies. An abstract interpreta-tion of the linkage between present interest-groups and watershed conditions shows that the fire exclusion policy is less to satisfy all interests than a rotation burning policy applied at individual watershed levels. A more abstract interpretation discusses the hypothesis that the fire exclusion policy persists because it stimulates increasing expenditures for fire exclusion through hazardous fuel accumulation. The report describes and evaluates the effect of restrictions on governmental spending, energy shortages, decreasing importance of local water supplies, and changes in the legal framework governing fire management on fire exclusion policy. (Snyder-California) W79-00449

A MODEL FOR EVALUATING ALTERNATIVE LAND DEVELOPMENTS AROUND LAKES, New Hampshire Univ., Durham. For primary bibliographic entry see Field 4C. W79-00460

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

WET COOLING TOWER BACKFITTING

ECONOMICS, Iowa Univ., Iowa City. Div. of Energy Engineering; and Iowa Univ., Iowa City. Div. of Research Engineering. For primary bibliographic entry see Field 5G.

W79-00233

THE OPTIMAL PRICING OF UNDEPLETABLE EXTERNALITIES,

Department of Energy, Washington, DC Office of Conservation and Solar Applications. N. D. Uri.

Environment and Planning A, Vol. 10, No. 3, p 287-294, 1978. 5 ref.

*Optimization, *Undepletable externalities, *Emission standards, *Economics, Externalities, General equilibrium models, Pareto optimality, Standards, Air pollution, Model studies, Analytical techniques.

A 'satisficing' approach is used to derive the quasi-optimal (or second-best) Pareto pricing solution resulting from imposition of an emission standard on an undepletable public good externality. Information requirements have led economists to use the satisficing approach, in which the most efficient method of obtaining an ex ante selected emission level is sought, the resulting solution being second-best. Baumol and Oates have demonstrated that the price system can provide an effective allocative mechanism only for depletable externalities; undepletable externalities are more difficult to analyze. An undepletable externality is analogous to a public good's externality in that an SSION ONAL E IM-, DC. NAGE-RNIA: analogous to a public good's externality in that an increase in the consumption of the good by one try and merease in the consumption of the good by one person doe not reduce its availability to another, such as breathing polluted air. In this study, a com-petitive general equilibrium pricing model in the Negishi framework is the basic analytical tool used. The solution yields two results: (1) If an iterative fee achieves the emission standard, the forma rofiche on No. standard, the solution will be quasi-optimal Pareto in the sense that consumers will have maximized their utility for the given level. (2) The appropriate emission tee sould be equal to that given by either of two equations included in the analysis, which require more information than does the Baumol and Oates

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LAND PRICES SUBSTANTIALLY UNDERESTI-THE VALUE OF ENVIRONMENTAL QUALITY, W. A. Niskanen, and S. H. Hanke.

solution, but which probably result in a fee requir-ing fewer iterations to reach the selected emission standard. (Lynch-Wisconsin)

W79-00239

The Review of Economics and Statistics, Vol. 54, No. 3, August 1977, p 375-377, 1 tab, 15 ref.

Descriptors: *Prices, *Land resources, *Value, *Environmental economics, *Discount rates, *Equity, *Public policy, Cost-benefit analysis, Theoretical analysis, Mathematical models, Model studies, Equations, Governments, Opportunity

Use of land prices to represent values of environ-mental amenities significantly understimates en-vironmental quality because this method excludesly the government's equity in land. It has generally been assumed that benefits of a public policy or project are quivalent to the difference in the mar-ket price of the affected land, that is, the discounted present value of the flow of net revenues and services received by private owners of the lands has been the only value considered. However, this measure underestimates total land productivity differences because local govern-ments also have an equity interest in the land, since land valuation is a base for property taxes. A model illustrates the relationship between dif-ferences in the total value of land and differences in the market prices. The total value of land is expressed by V = P + G = R/i = P(1 + t/i), where P is the market price of land, G is government equity, R is the annual rental value of land without property taxes, i is the rel opportunity cost of capital to private owners, and t is the effective property tax rate on the market price of land. The difference in total property value due to a policy change is: delta V=delta P(1+t/i). It is seen that in several studies difference in land values was underestimated by 60-99%. (Lynch-Wisconsin) W79-00244

ECONOMIC IMPACTS OF PULP AND PAPER INDUSTRY COMPLIANCE WITH ENVIRON-MENTAL REGULATIONS. VOLUME I. SUM-MARY AND AGGREGATE INDUSTRY IMPACT

Little (Arthur D.), Inc., Cambridge, MA. For primary bibliographic entry see Field 6E. W79-00430

6D. Water Demand

WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA, Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineer-

ing. T. L. Elchak, D. L. Raphael, J. P. Ignizio, and H.

1. L. Eichak, D. L. Raphael, J. P. Ignizio, and H. H. Martinez.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 577.

Price codes: A07 in paper copy, A01 in microfiche.

Completion Report, The Pennsylvania State
University, Institute for Research on Land and
Water Resources, September 1978. 138 p, 13 tab,
10 fig. 5 append. OWRT A-048-PA(3). 14-34-00017080.

Descriptors: "Water supply, "Water demand, Water utilization, "Pennsylvania, Water resources, Water shortage, Water use, "Model studies, Interactive water, Energy model, "Water use functions, "Energy supply, Demand, "Linear flow model, "Optimization, Electrical generation, Energy demand, Energy supply.

Growing energy demands and dwindling energy supplies have only recently become topics of na-tional and worldwide concern. The economic and energy crises of the 1970's have amplified these concerns. Likewise, water resources are presumed non-exhaustible and are only serious topics of in-terest when severe water shortages or natural catastrophies strike regional areas of the country. The two types of resources, energy and water, are vitally linked together because energy supply, con-version and end use depend heavily upon water resources. An interactive water/energy model is presented for the state of Pennsylvania. An independent water model and energy model are joined together to show the interactions between energy supply and demand with the supply of water. supply and demand with the supply of water. These interactions are depicted by water use functions for various energy sectors. Specific examples are presented for the electrical generation sectors. Two hypothetical scenarios are presented to show the use of the model as a planning tool. One scenario utilizes goal programming to optimize a number of energy uses at different priority levels. Some recommendations are offered. (Sink-Penn St) W79-00007

POINT SOURCE ANALYSIS. INVENTORY, WATER DEMANDS, AND PROBLEM AREA IDENTIFICATION. (AREAWIDE WASTE TREATMENT PLAN FOR THE GREATER HOUSTON AREA. SECTION 208, PL 92-500. Houston-Galveston Area Council, TX. Available from the National Technical Information Service, Springfield, VA 22161 as PB-276 761, Price codes: A06 in paper copy, A01 in microfiche. July 1977. 107 p, 30 tab, 2 append.

Descriptors: *Water management, *Water demand, *Water supply, *Water utilization, *Water policy, *Water quality, *Houston, *Galveston, Federal Water Pollution Control Act, Water allocation(Policy), Groundwater, Surface water, Waste water, Municipal wastes, Industrial wastes, Water pollution, Surface waters, Data collections, Future planning(Projected), Water quality.

A point source inventory was carried out to locate and characterize significant industrial discharge to the municipal sewer system and directly to surface waters within the greater Houston area. Data, such waters within the greater Houston area. Data, such as identity, locations, and characterization of sources were incorporated into storage-retrieval systems and discharge points were plotted on location maps. Water demands were modeled for the planning period 1975 to 1995 and projected according to sub basin and user. Separate equations were used for industrial, agricultural, power generation, and domestic categories. It is predicted that, in general, water demands will exceed supplies in fu-

ture years, although a number of factors will mitigate the deficits. These factors are described in detail and attempts were made to identify which sources could meet specific demands. Also, efforts were directed toward allocating demands to groundwater or surface water supplies and ordering allocations by user category and sub basin. Finally, the existing water quality and projected wasteloads were identified for specific stream segments. Ten of these segments which are not exments. Ten of these segments which are not ex-pected to meet water quality standards were designated problem areas. The methodologies used to project industrial wasteload and municipal wasteload are described in the appendices. (Majtenyi-IPA)
W79-00104

WATER USAGE REQUIRES PLANNING, Universal Oil Products, Inc., Saint Paul, MN. Johnson Div. R. J. Havrilak, Jr. Johnson Driller's Journal, Vol. 50, No. 4, July-August, 1978, p 4-5. 1 fig.

Descriptors: "Water utilization, "Water manage-ment(Applied), "Planning, Water demand, Water quality, Water permits, Water resources develop-ment, Ground water, Surface water.

Over 420 billion gallons of water are used each day in the United States. This usage is controlled by water resources development plans that vary in complexity and scale from an individual water source to an industrial or municipal water supply. The water quantity and quality for the intended use should first be determined from available data. Then, a source must be found in ground water, surface water, or a combination of both. Ground water and surface water availability maps can be obtained from state and national geological surveys. Withdrawals from surface and ground water veys. Withdrawals from surface and ground water supplies are controlled by various regulatory agencies. Where possible, a comparison of all potential sources should be made, including such considerations as reliability, treatment requirements, initial cost, maintenance and operating costs, and compliance with government regulations. Once a suitable source has been chosen it should be developed to its full potential. With ground water, this means paying attention to the aquifer characteristics, well construction, and drilling and development techniques. With surface water, special attention must be directed toward the design and siting of the intake screen, cleaning the screen, and keeping the intake screen, cleaning the screen, and keeping entrance velocity low-less than .5 FPS-at any point on the screen. (Purdin-NWWA) W79-00183

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, SUMMARY REPORT. Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F. W79-00191

THE DEMAND FOR CLEAN WATER: THE CASE OF THE CHARLES RIVER, Department of Justice, Washington, DC. Antitrust For primary bibliographic entry see Field 6B. W79-00234

RESIDENTIAL WATER CONSERVATION, Colorado Univ., Boulder. For primary bibliographic entry see Field 3D. W79-00440

RESOURCE ANALYSIS: WATER AND ENERGY AS LINKED RESOURCES, AS LINKED RESOURCES, Chicago Univ., IL. M. Lounsbury, S. Hebenstreit, and R. S. Berry. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as PB-288 046,

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

Price codes: A10 in paper copy, A01 in microfiche. University of Illinois Water Resources Center, Urbana, Research Report No. 134, July 1978. 189 p. 46 fig, 79 tab, 2 ref, 2 append.

Descriptors: *Energy, Irrigation water, *Municipal water, *Water supply, Energy analysis, *Municipal sewage treatment, Growth rates, Energy requirements.

Energy and water are linked resources. This pilot study examines the relationship between energy and water from a direction opposite to that of most studies. An evaluation is made of the energy required to supply and treat water, rather than the water requirements of energy production. The pri mary energy requirements for three sectors of water management--municipal water supply, mu-nicipal sewage treatment, and water for irrigation-are evaluated. Six major cities, Chicago, Denver, Los Angeles, New Orleans, San Antonio, and St Louis, are used as indicators of the national trend in energy requirements to supply water municipali-ties. Nationwide data provided by the federal En-vironmental Protection Agency for 1977 and 1990 are used to determine the rate of change of energy required to treat municipal sewage over this period. The energy required to supply water for irrigation is estimated for three regions in the Southwest: Kern County, California; the Texas high plains; and San Carlos, Arizona. Historic trends and prospects for future development are used to estimate future energy requirements for each of these water sectors. The projections are compared to expected increases in national energy consumption. The results indicate that: (1) regional differences in the amount of energy needed to supply water are very large, increasing in some places and decreasing in others; (2) significant nationwide increases are likely for the energy required to treat sewage; and (3) noncritical shortrequired to freat sewage; and (3) noncritical short-term increases will occur in the total energy requirement to supply irrigation water, but after the year 2000, the Southwest faces an extremely difficult choice in balancing its resources of ener-gy, water, and agricultural land, particularly in the light of its arowing when denser to light of its growing urban demands. W79-00453

6E. Water Law and Institutions

A COMPARATIVE STUDY OF COMMUNITY RESPONSE TO WATER RELATED

Delaware Univ., Newark. Dept. of Sociology For primary bibliographic entry see Field 6B. W79-00010

PROTECTION OF OUTDOOR RECREATION VALUES OF RIVERS.

Heritage Conservation and Recreation Service. Washington, DC.

For primary bibliographic entry see Field 6B. W79-00093

PUBLIC OUTDOOR RECREATION BENEFITS OF FEDERAL WATER RESOURCE PROJECTS. Heritage Conservation and Recreation Service, Washington, DC.

1978 Nationwide Outdoor Recreation Plan, Task Force Report. 39 p, 1 append.

Descriptors: "Water resources, "Recreation, "Environmental resources, "Water resources development, "Water policy, Wetlands, Flood-plains, Coastal beaches, Lakes, Water utilization, Estuaries, Water resource prograter policy, Federal Government Water resource programs, Federal

Seven national water related recreation and environmental action objectives are identified and methods for fulfilling these objectives are sug-gested. Topics covered include: maintenance of in-stream flows; evaluation and protection of wet-

lands, estuaries and other important areas; protec-tion and enhancement of flood plains; direction and encouragement of maximization of cost-effec-tive recreation opportunities, and Federal water resource development projects. Following a state-ment of each action objective, background related to the objective is provided, directly related authorities (statutes, Executive Orders and other Presidential documents or directives to the Executive Branch) are identified, action needs are briefly discussed, and action options are presented. The appendix provides a list of authori-ties cited and a brief description of applicable sections. (Gibson-IPA)

FEDERAL OUTDOOR RECREATION LAND ACQUISITION-LWCF

Heritage Conservation and Recreation Service, Washington, DC. 1978 Nationwide Outdoor Recreation Plan, Task Force Report. 22 p. 2 tab, 1 append.

Descriptors: *Recreation, *Land development, *Land management, *Land and Water Conservation Fund(LWCF), National Park Service, Forest Service, Fish and Wildlife Service, Wild and Scenic River Act, National Wilderness Preservation Systems Act, National Recreation Areas, Federal Government, Land use.

Federal policy as it relates to Federal land acquisition for recreational, natural, and cultura resources, is examined. Included is a brief descrip tion of the Land and Water Conservation Fu (LWCF) Act of 1965, what has been accomplished with the LWCF, and what future demands are expected on the fund. At present some 27 different authorities can be used by the Forest Service, National Park Service, Fish and Wildlife Service, and the Bureau of Land Management, to obtain land for over 20 separate land categories. Also, there may be conflicts or at least ill-defined authority relating to specific land preservation acts, such as the National Wilderness Preservation System Act and the Wild and Scenic Rivers Act. It is recom-mended that an effective Federal policy contain a mended that an effective Federal policy contain a clearly stated direction, standards and guidelines for implementation, and a statement of responsi-bilities and process delineating appropriate agency actions. Agencies using the LWCF, their acquisi-tion's policy, authorities, types of area acquired and acquisition priorities are listed in the appen-dix. (Majtenyi-IPA)

ROLES/FUNCTIONS OF FEDERAL, STATE AND LOCAL PUBLIC AGENCIES. Heritage Conservation and Recreation Service, Washington, DC.

1978 Nationwide Outdoor Recreation Plan, Task Force Report. 39 p, 3 tab, 1 ref.

Descriptors: "Recreation, "Legislation, "Recreation (acilities, "Land management, "State Government, "Local Government, Social needs, National recreation areas, State recreation areas, Conservation, Land use, National parks, Scenery, Water management, Government.

In the past, proliferation of Federal actions, aid. and assistance programs throughout some 50 bu reaus, 35 offices, and numerous commissions has created confusion and inhibited coordination in the field of outdoor recreation. This review examined existing systems to determine how some amined existing systems to determine how some policies might be changed or shifted to yield a more logical approach. The historical perspective on outdoor recreation policy is traced from pre-World War II to the present with a brief summary of the Acts and Federal studies in this field. A philosophy for recreation roles and responsibilities is defined for various segments of society. For ex-ample, the Federal role, in addition to its legislated land and water management responsibility, will primarily be supportive to the extent of providing

the incentive and assistance for State and local governments. Local governments will look to ese upgraded state programs for guidandes, and for producing on-the-ground resul The private sector will complement the State-local-Federal role by providing additional services and facilities where profit and price are a part. Private non-profit organizations can play a vital role in providing recreation opportunity, especially in flexibility, diversity and cost-effective uses. The private citizen should take part in planning at all levels to represent the user's vital point of view. More detailed jurisdictional level responsibilities for outdoor recreation are explained for each segment listed above, but the report stresses that the most important factor in achieving an efficient recreation program is the inachieving an efficient recreation program is the in-terrelationship and interdependence of all these segments. (Majtenyi-IPA) W79-00098

POINT SOURCE ANALYSIS. INVENTORY, WATER DEMANDS, AND PROBLEM AREA IDENTIFICATION. (AREAWIDE WASTE TREATMENT PLAN FOR THE GREATER HOUSTON AREA. SECTION 208, PL 92-500. Houston-Galveston Area Council, TX. For primary bibliographic entry see Field 6D. W79-00104

THE DEVELOPMENT OF THE ELECTRICAL POWER SYSTEM IN THE PACIFIC NORTHWEST, A PUBLIC POLICY PERSPEC-

TIVE, Washington Univ., Seattle. R. G. Walton

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-287 623, Price codes: A09 in paper copy, A01 in microfiche. M.S. Thesis, 1976, 174 p, 6 fig, 6 tab, 2 maps, 45 ref, 9 append. OWRT A-079-WASH(2).

escriptors: *Electrical power system, *Pacific Northwest, Policy, *Decision-making.

The objective is to provide a description and analysis of the development of the electrical energy system in the Pacific Northwest from the late 1950's to 1976, from a public policy perspective. Unprecedented changes have appeared in the electrical energy picture in the PNW in recent years, and the near future promises to produce additional decisions of significant importance to the region.

The arrival of large capacity thermal-electric power plants in the region (both coal and nuclear), and plans for many more, have been accompanied by greatly increased public attention to energy and the environment. The controversies that have ensued are complex, and the manner in which they are to be resolved is of great interest and concern to a large number of individuals and organizations. In spite of these facts, however, the level of citizen awareness of the region's plans for electrical power development, how these plans have been chosen, and by whom, appears to remain at a very low level. Considerable attention has been given to the historical evolution of the regional ower system. This has helped to place the present dilemma in context as the requirements placed on electric energy planners have evolved with the growth in generation and use of electricity.

W79-00143

REGIONAL ELECTRIC ENERGY PLANNING: A CASE STUDY IN THE POLITICS OF SCARCE RESOURCES

Washington Univ., Seattle.

Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-287 625, Price codes: A08 in paper copy, A01 in microfiche. Master Thesis, 1976, 128 p, 1 map, 92 ref. OWRT A-079-WASH(1). Descrip *Pacifi sues, S Oregon

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pa er's part in An attempt was made to examine the regional electric energy picture in the Pacific Northwest. Using the Bonneville Power Administration and Seattle City Light as two major foci, the analysis discusses the past and present interaction of the regional electric energy planning entities. The major contention is that the utility industry faces an increasingly difficult set of policy decisions while lacking an adequate institutional framework in which to resolve them. This void is exacerbated in which to resolve them. This void is exacerbated by the imminence of decreasing resources, both environmental and financial. These shortages have, in turn, made the consequences of utility ac-tions increasingly significant. The implications and results of this lack are discussed and some poten-tial solutions suggested. W79-00144

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT: DISCUSSION (ANDERSON), Delaware Univ., Newark. Dept of Economics.

L. G. Anderson. American Journal of Agricultural Economics, Vol. 59, No. 5, p 883-884, December 1977. 2 ref.

Descriptors: "Fisheries, "Fish management, "Commercial fishing, "Economics, "Jurisdiction, "Welfare(Economics), Fish conservation, Fishery Conservation and Management Act of 1976, Theoretical analysis, Institutional constraints, Regulation, Economic efficiency, Political constraints, Taxes.

A critique of Huppert's 1977 paper on constraints to welfare gains in U.S. fisheries management focuses on the definition of welfare, provisions of the Fishery Conservation and Management Act of the Fishery Conservation and Management Act of 1976 (FCMA) relating to economic allocation and efficiency, and recreational fishing data. According to Huppert, 'welfare gains' are really potential welfare gains, or more properly, the attainment of economic efficiency. Huppert identifies five potential barriers to economic efficiency: (1) overlapping authority among states and foreign countries; (2) provisions of FCMA, especially restrictions on taxes as a regulation tool; (3) the regional orientation of the councils; (4) industry comination of the councils; and (5) inadequate knowledge of recreational fishing. National standard 5 of FCMA states that 'conservation and management measures. recreational rising. National standard 5 of FCMA states that 'conservation and management measures shall...promote efficiency in the utilization of fishery resources; except that no such measure shall have economic allocation as its sole purpose.' The second phrase essentially negates the first, and could more seriously retard progress toward recognition. and could more seriously retard progress toward economic efficiency than restrictions on use of taxes. Preliminary guidelines for implementing FCMA do not entirely clarify the relative emphasis to be given economic efficiency as a management goal. The lack of data on recreational fishing is really a problem of lack of adequate social and economic information in general. (Lynch-Wisconsin) W79-00235

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POLICY AND RESEARCH ISSUES IN THE

FISHERY, Wisconsin Univ.-Madison, Dept. of Agricultural

D. W. Bromley. American Journal of Agricultural Economics, Vol. 59, No. 5, p 887-892, December 1977. 9 ref.

escriptors: *Fisheries, *Fish management, "Distribution, "Access, "Economics, "Welfare (Economics), "Public policy, Jurisdiction, Model studies, Research studies, Theoretical analysis, Policy, Commercial fishing, Income distribution, Economic efficiency, Social aspects, Social impact, General equilibrium models, Willingness to pay.

In economic analysis of extended fisheries ju-risdiction, important insights are gained by a more careful specification of the traditional steady-state/yield-effort models, and by viewing ex-tended jurisdiction economics in the framework of welfare theory. Fishery distribution is analyzed, a simple model is presented for assessing international distributional implications of extended jurisdiction, access to the enlarge domestic fishery is discussed, and research and policy implications are reviewed. Distributional aspects have been ignored because economists have been using the wrong conceptual framework; traditional fishery models consider fishermen mere factors of production, aggregated as 'effort', not as independent decision-making units. Applying welfare economics to the fishery problem focuses distribution as central to any policy recommendation.

Considerable difference of opinion exists regarding the role of economics in determining who should have access to the fishery; various aspects of valuation of those desiring access are discussed. As devastating long-run economic losses can accure to those denied access to the fishery, it would seem logical that economics should have something to offer in such an important policy issue. Devestically a distributionally related sometaing to offer in such an important policy issue. Domestically, a distributionally related management program should pay careful attention to the real mobility, both monetarily and non-monetarily, of all who seek access. (See also W79-00237 and W79-00238) W79-00236

DISTRIBUTIONAL IMPLICATIONS OF EX-TENDED FISHERIES JURISDICTION: SOME RESEARCH AND POLICY ISSUES: DISCUS-SION, Rhode Island Univ., Kingston, Dept. of Resource

D. L. Hueth, and V. J. Norton. American Journal of Agricultural Economics, Vol. 59, No. 5, p 895-897, December 1977. 9 ref.

Descriptors: *Fisheries, *Fish management, *Distribution, *Access, *Economics, *Welfare(Economics), *Public policy, Jurisdiction, Model studies, Research priorities, Theoretical analysis, Policy, Commercial fishing, Income distribution, Economic efficiency, Social aspects, Social impact, General equilibrium models, Willingness to pay.

Bromley's 1977 paper on the distributional implications of extended fisheries jurisdiction is criticized. In general equilibrium analysis of international fisheries the interdependent production possibility curves illustrated in Bromley's Figure I imply that complete specialization in fisheries by both countries would produce more fish than is possible. Since the assumptions of Figure I are basic to Bromley's international analysis, his conclusions in that section are questionable. Two aspects of Bromley's domestic analysis also cause concern: (1) He has made important implicit distribution decisions regarding allocation within each group, without which there would be no economic rent or willingness to pay for access is questionable. He assumes a net present value (NPV) of access of 105 for group CF and an NPV of their best alternative of 95. It is unclear why this group would be willing to pay more than 10 for the right to fish. What Bromley calculates as the NPV for access minus the NPV for the alternative would in fact represent willingness to any for access. Bromley seems to suppose access. alternative would in fact represent willingness to pay for access. Bromley seems to suggest access be allocated to the highest bidder, a procedure he questioned earlier. The difference in NPV also represents maximization of rents (or benefits) to the resources, which Bromley argues is nonsense'. To help determine the advantageousness of a policy, the purely ordinal general equilibrium framework should be replaced

by the economic surplus framework. Research needs are listed. See also W79-00236 and W79-00238. (Lynch-Wosconsin) W79-00237

DISTRIBUTIONAL IMPLICATIONS OF THE EXTENDED ECONOMIC ZONE: SOME POL-ICY AND RESEARCH ISSUES IN THE

ICY AND RESEARCH ISSUES IN THE FISHERY: DISCUSSION, Oregon State Univ., Corvallis. Dept. of Agricultural and Resource Economics. R. S. Johnston, and F. J. Smith. American Journal of Agricultural Economics, Vol. 59, No. 5, p 893-894, December 1977.

Descriptors: *Fisheries, *Fish management, Descriptors: "Fisheries, "Fish management, "Distribution, "Access, "Economics, "Welfare(Economics), "Public policy, Jurisdiction, Model studies, Theoretical analysis, Policy, Commercial fishing, Income distribution, Economic efficiency, Social aspects, Social im-

Two point of criticism are given on Bromley's 1977 paper on distributional implications of the extended economic zone in the fishery: (1) A cleared distinction is needed between use of welfare theory to prescribe policy (normative) and its use in predicting consequences of policy decisions (positive). (2) Whether distribution is a dimension of economic efficiency or is a separate socially relevant variable should be clarified. Bromley goes beyond identifying distributional consequences of fishery policy and suggests fishery policies on the basis of their distributional consequences.

Theoretical constructs are generally used by economists to predict consequences of alternative policies, not to prescribe policy for the greatest benefit to all. Bromley should therefore clarify when he is writing as an economist and when as a when he is writing as an economist and when as a manager. In regard to the second point, Bromley argues that efficiency (or maximum net economic rent) is only one socially relevant variable, but his discussion of distribution does not explain if it should be considered another socially relevant variable or a dimension of efficiency. If the former, there are many more that also deserve consideration. If the latter, distributional dimensions of other socially relevant variables must be accounted for. It is likely that commercial fishermen would rank efficiency law on a list of socially men would rank efficiency low on a list of socially relevant variables. Greater consistency of example of the use of welfare economics is also desirable. (See also W79-00236 and W79-00237) (Lynch-Wisconsin)

CONSTRAINTS TO WELFARE GAINS UNDER EXTENDED JURISDICTION FISHERIES MANAGEMENT, National Marine Fisheries Service, La Jolla, CA.

Naudian Maintenance D. D. Huppert.

American Journal of Agricultural Economics, Vol. 59, No. 5, p 877-882, December 1977. 17 ref.

Descriptors: *Fisheries, *Fish management, *Commercial fishing, *Economics, *Jurisdiction, *Welfare(Economics), Fish conservation, Fishery Conservation and Management Act of 1976, In-come distribution, Theoretical analysis, Institu-tional constraints, Regulation, Economic efficien-cy, Political constraints, Taxes.

With extension of the U.S. fishery conservation zone to 200 miles off the Atlantic and Pacific coasts and adoption of management economic ob-jectives in the Fishery Conservation and Manage-ment Act of 1976 (FCMA), welfare gains become important. Constraints to such gains include: (1) lack of comprehensive and unified management authority; (2) certain provisions of FCMA (e.g., authority; (2) certain provisions of FCMA (e.g., restricting use of fees or landings taxes; (3) regional orientation of the fishery councils and their domination by industry spokesmen; and (4) in-adequate economic knowledge of recreational fisheries. FCMA establishes conditions for im-

Field 6-WATER RESOURCES PLANNING

Group 6E-Water Law and Institutions

proved economic performance: (1) establishment of federal authority over areas broad enough to allow unified management; (2) creation of regional councils to develop management plans with industry and scientific cooperation; (3) economic criteria for fishery management plans; and (4) means to control foreign fishing harvests within the U.S. zone. Success of the management effort the U.S. zone. Success of the management effort will depend more upon actions and attitudes of fishery councils and federal authorities than upon any rigid institutional constraints. Maximization of social welfare and economic gains will not necessarily result from such traditional biological goals as maximum sustainable physical yield; instead, consideration is needed of economic values energied by fisheries private and social costs of consideration is needed of economic values generated by fisheries, private and social costs of fishery exploitation and management, and probable income distribution resulting from regulations. (Lynch-Wisconsin) W79-00240

PROPERTY RULES, LIABILITY RULES, AND ENVIRONMENTAL ECONOMICS,

Wisconsin Univ.-Madison. Center for Resource Policy Studies. D. W. Bromley.

Journal of Economic Issues, Vol. 12, No. 1, p 43-60, March 1978. 2 tab, 22 ref.

Descriptors: *Environmental economics, *Liability, "Economics, "Property rights, "Liability, "Externalities, "Entitlements, Decision making, Model studies, Methodology, Classification, Pol-icy, Theoretical analysis, Rules.

While environmental economics has fully emerged as a subdiscipline of economics, as signalled by works of Baumol and Oates (1975 and Fisher and Peterson (1976), there has been little explicit discussion of the central role of alternative assignments of property rights. Standard policy has been to internalize externalities by changing property rights and thus the scope of decision-making. This paper attempts to fill a theoretical gap with a tax onomy of entitlements (property rights) developed by Calabresi and Melamed (1972), and also suggests several important considerations in exter-nality situations. Human interference is here regarded as multifaceted, and assumptions that transactions costs are low or zero, that only two parties are engaged in bargaining, and that there is a unique damage function are not taken for granted. Calabresi and melamed postulated three basic types of entitlements, adopted here: (1) those protected by property rules, (2) those protected by liability rules, and (3) inalienable entitlements. Five rules of entitlement are summarized in a table. It is shown that under a property rule negotiation and agreement must occur prior to an action, while under a liability rule actions with interfering aspects will occur, and compensation follows the action. In situations involving many in-dividuals, a liability is more practical. A concluding section assesses implications for invironmental policy-making. (Lynch-Wisconsin) W79-00241

NATURAL RESOURCE ECONOMICS: THE UP-SETTING DISCIPLINE, Arizona Univ., Tucson. Dept. of Agricultural

Economics For primary bibliographic entry see Field 6B.

W79-00242

A SOCIO-ECONOMIC APPROACH TO WATER POLLUTION LAW ENFORCEMENT IN EN-GLAND AND WALES.

Newcastle-upon-Type Univ. (England). Dept. of **Economics**

For primary bibliographic entry see Field 5G. W79-00245

THE NATIONAL WATER COMMISSION REVISITED PERSPECTIVE ON NATIONAL

WATER POLICY STUDIES, WITH SOME IM-PLICATIONS FOR CHANGES IN FUTURE WATER POLICY, National Research Council, Washington, DC.

Commission on Natural Resources

Water Resources Bulletin, Vol. 14, No. 2, p 302-312, April 1978, 6 ref.

*National Water Commission, Descriptors: *Water policy, Water conservation, Policy formulation, Government reorganization, Recommenda-

In 1973 the National Water Commission concluded its five-year study of national water policy by issu-ing a massive report containing over 200 recom-mendations for improvements in the way the Nation deals with its water resources. The Carter Administration is now engaged in another water policy review which incorporated many of the poli-cies espoused by the National Water Commission. In this paper, which was presented at the 13th American Water Resources Conference in Tucson in November of 1977, the author describes the work of the National Water Commission and the actions taken on its recommendations. (Bell-Cor-W79-00383

WATER ADMINISTRATION IN ENGLAND AND WALES IMPACTS OF REORGANIZATION, Victoria Univ. (British Columbia). Dept. of Geog-

raphy. W. R. D. Sewell, and L. R. Barr. Water Resources Bulietin, Vol. 14, No. 2, p 337-348, April 1978. 2 fig, 3 tab.

Descriptors: *Water management(Applied), *Administration, *England, *Wales, *Legislation, *Water authorities, Reorganization, Institutions, *Water Policy, Organizational structure, Recruitment patterns

Water management in England and Wales has undergone a major transformation in the past three ides, and especially under the 1963 and 1973 legislation. It has witnessed a shift from local to national responsibility, an integration of functions, and a move towards the incorporation of economic principles into water policies. For some observers, the new legislation appeared to be pioneering and farsighted. There is little doubt that it has resulted in many beneficial changes. However, not all the goals have been achieved. Modification of the goals have been achieved. Modification of the 1973 legislation are already in prospect. Reviewed herein are the progress to date and comments on the problems now to be faced. (Bell-Cornell) W79-00384

MANAGEMENT ASPECTS OF STORAGE OF WATER IN AQUIFER SYSTEMS, California State Dept. of Water Resources, Sacramento. Div. of Planning. For primary bibliographic entry see Field 4B. W79-00386

A STUDY OF COASTAL POLLUTION AND AGENCY INTERFACE, University of Southern Mississippi, Hattiesburg. Coll. of Business Administration For primary bibliographic entry see Field 5G. W79-00389

AN ANALYSIS OF CRITICISMS OF INTERNA-TIONAL FISHERY ORGANIZATIONS WITH REFERENCE TO THREE AGENCIES ASSOCIATED WITH THE CANADIAN WEST COAST FISHERY, Waterloo Univ. (Ontario). Dept. of Geography

B. Mitchell, and H. M. Huntley.

Journal of Environmental Management, Vol. 5,

No. 1, p 47-73, January 1977. 9 tab, 23 ref.

Descriptors: "Fisheries, "Canada, "Management, "International agencies, "Criticisms, Literature review, Research procedure, Fishing industry, En-forcement, Regulation, Decision making.

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This study purposed to identify weaknesses of in-ternational fishery agencies and to explore their implications for management. Based upon a literaimplications for management. Based upon a literature review, nine common criticisms of international fishery organizations are identified relating to allocation of power, acceptability of recommendations, enforcement responsibility, regulation of non-member nations, flexibility, type-of research staff, generation of data, communication and public involvement. These criticisms are then examined relative to three international agencies associated with the Canadian west coast fishery: the International agencies associated with the Canadian west coast fishery: the International North Pacific Fisheries Commission, International Pacific Salmon Commission, These organizations vary in terms of structure, target species and management problems. Data were collected during vary in terms of structure, target species am management problems. Data were collected during three months in the summer of 1974 by personal interviews. Respondents were selected from vari-ous groups within the industry. Interviews were completed with respresentatives from the international fishery organizations, national government fishery departments, provincial government agen-cies, fishermen, processors, and external experts. The findings suggest two types of criticism: (1) consensus exists as to the validity of the criticism but variation emerges as to whether their effects on management have positive or negative impacts; and (2) it is agreed that the criticisms are relevant and that they have a negative effect on manage-ment practices. For either category, no simple solutions exist; alternatives are available, each having its own strong and weak points. (Bell-Cornell) W79-00394

LOOKING AT THE POSITIVE SIDE OF ENER-GY REGULATION, Fraser Companies Ltd., Madawaska, ME. For primary bibliographic entry see Field 3E.

ECONOMIC IMPACTS OF PULP AND PAPER INDUSTRY COMPLIANCE WITH ENVIRONMENTAL REGULATIONS. VOLUME I. SUM-MARY AND AGGREGATE INDUSTRY IMPACT

Little (Arthur D.), Inc., Cambridge, MA. Available from the National Technical Informa tion Service, Springfield, VA 22161 as PB-268 742, Price codes: A10 in paper copy, A01 in microfiche. Environmental Protection Agency, Report EPA-230/3-76-014-1, 221 p, May 1977. 38 fig, 76 tab.

Descriptors: *Pulp and paper industry, *Economic impact, *Environment, *Protection, Water pollution control, Air pollution, Economics, Costs Water pollution sources, Legislation, Regulation, Econometrics, Pollution abatement, Prices, Demand, Financing, Foreign trade, Import, Export, Noise, Legal compliance.

This report estimates the potential economic impacts that would result from the pulp and paper in-dustry's compliance with the following existing or proposed environmental regulations: water (those issued by the EPA for existing and new capacity; air (those issued by states for the existing industry and those issued by the EPA for new capacity; and noise (those issued by OSHA). The analysis does noise (those issued by OSHA). The analysis does not include costs or impacts associated with timberlands or paper/paperboard converting operations (except wher converting is done at the paper mill). The impacts of complying with these regulations on paper prices and demand, short-term capacity constraints, secondary impacts on suppliers, mill closures, external financing requirements, and balance of trade (imports/exports) are discussed. Econometric analysis was used to estimate the contract of the contra agement, Literature

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ND PAPER ENVIRON-IE I. SUM-RY IMPACT A. cal Informa-

PB-268 742, microfiche. Report EPA-, 76 tab. *Economic

Water pollu-nics, Costs, Regulation, Prices, Deort, Export,

conomic imand paper in-ng existing or water (those ew capacity); sting industry capacity; and analysis does ted with timerting operathese regula-i, short-term pacts on supcing require s/exports) are mate demand and supply curves for the major product sectors, and the economics of model mills was used to assess closures and long-term prices. A financial funds flow model is developed to estimate cash flow requirements for growth and environmental costs. (Witt-IPC) W79-00430

6F. Nonstructural Alternatives

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975. SUMMARY REPORT. Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F. W79-00191

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL MANAGEMENT STRATE-GY FOR THE GREAT LAKES SYSTEM.
International Reference Group on Great Lakes
Pollution from Land Use Activities.
For primary bibliographic entry see Field 5G.
W79-00084

RESEARCH TO ANTICIPATE ENVIRONMENTAL IMPACTS OF CHANGING RESOURCE

TAL IMPACTS OF CHANGING RESOURCE USAGE. Stanford Research Inst., Menlo Park, CA. Available from the National Technical Information Service, Springfield, VA 22161 as PB-256 293, Price codes: A12 in paper copy, A01 in microfiche. Report EPA-600/9-76-022. Proceedings of Symposium held August 27-28, 1975, Menlo Park, California, April 1976. 276 p. Moll, K. D., Editor. 68-01-2940 No. 17.

Descriptors: *Resources development, *Ecology, *Environmental effects, *Conferences, *Research priorities, Environmental engineering, Systems analysis, Natural resources, Resources, Social change, Socio-environmental research assessments, Environmental control.

Fourteen papers by authorities from government, academia, industry, and other institutions are provided that deal with research and policy problems facing the Environmental Protection Agency from recent and prospective changes in availability of such natural resources as energy, minerals, agricultural land, and clean air and water. One important aspect examined is the complex nature of interactions among resources, environment, and social values and the need for research on patterns of such interactions. Also discussed is the need for increased research in areas, such as patterns of resource flow and usage, economic and social in-centives for controlling the environment, and on emerging potentially critical ecological problems. Others focus on environmental monitoring and as-sessment techniques and specific applied research and technology development programs. (Majtenyi-IPA) W79-00085

ENERGY CONSERVATION AND OUTDOOR RECREATION, Heritage Conservation and Recreation Service, Washington, DC.
T. D. Bever, and F. P. Dodd.

1978 Nationwide Outdoor Recreation Plan, Task Force Report. 24 p, 4 tab, 18 ref.

Descriptors: *Recreation, *Energy, *Energy conbescriptors: Recreation, Energy, Energy consumption, Recreation facilities, Transportation, Tourism, Social aspects, Scenic highways, Recreation demand, Recreational vehicles, National parks, Local

How the supply and price of energy affects recreation, and how recreation can conserve energy resources is explained. Recreation involves consumption of energy in a variety of indirect ways, such as maufacture of recreational goods, and maintenance of recreational facilities and associated business, such as gas stations, hotels, and restaurants. A more direct use of energy is the fuel sociated business, such as gas stations, hotels, and restaurants. A more direct use of energy is the fuel consumption needed to travel to recreational areas and fuel consumed by recreational vehicles. Such consumption is expected to increase steadily at a rate of 3% a year. One suggested method for conserving such energy is development of more efficient automobile engines but this will not aid those who cannot afford to buy a new, more efficient vehicle. An alternative is to encourage use of mass transit facilities where they exist by providing better information on availability, improved scheduling, and more frequent service. Another approach is to develop new recreational areas closer on recreation is discussed, with emphasis on rising gasoline prices and its predicted effect on travel. Although travel to National parks did decline 13% during the 1973-1974 oil crises; it is difficult to project the effect of slow, regular price increases expected over the next 5 to 10 years. Included are a list of areas for further research and a summary of policy questions which will have to be addressed in the near future. (Majtenyi-IPA) W79-00096

NEEDS OF PRIVATE FOR PROFIT ENTER-PRISES IN OUTDOOR RECREATION. Heritage Conservation and Recreation Service,

Washington, DC. For primary bibliographic entry see Field 6B. W79-00097

FISH AND WILDLIFE INVENTORY OF THE SEVEN-COUNTY REGION INCLUDED IN THE CENTRAL FLORIDA PHOSPHATE INDUSTRY AREA-WIDE ENVIRONMENTAL IMPACT STUDY. VOLUMES I AND II, American Museum of Natural History, Placid, FL. Archbold Biological Station.
For primary bibliographic entry see Field 5C. W79-00100

ORGANIZED RESISTANCE TO AN IMPOSED ENVIRONMENTAL CHANGE. A RESERVOIR IN EASTERN KENTUCKY, Kentucky Water Resources Research Inst., Lex-

For primary bibliographic entry see Field 6B. W79-00142

IMPACTS OF IMPOUNDMENT TO VER-TEBRATE ANIMALS AND THEIR HABITATS IN THE SNAKE RIVER CANYON, WASHING-TON,

Washington State Univ., Pullman. Dept. of Zoolo-

gy.
R. E. Lewke, and I. O. Buss.
Northwest Science, Vol. 51, No. 4, p 219-270, 1977, 18 fig, 19 tab, 62 ref. OWRT-A-054-

Descriptors: *Impoundment impacts, Above-pool habitats, Below-pool habitats, Floodplains, Lower Granite area(Wash), Wildlife, *Washington, Environmental effects.

Impoundment by Lower Granite Dam on the Snake River inundated 1,319 ha of wildlife habitat; Snake River inundated 1,319 ha of wildlife habitat; 210 ha represented tree-shrub riparian habitat and 1,109 ha represented weedy-floodplain habitat. These habitat were of paramount importance to wildlife, particularly in winter. Sixty-five of 129 species studied were significantly dependent upon tree-shrub riparian habitat. Thirty-four species were significantly dependent upon riverbank-floodplain habitat. Birds forced from these habitats by inundation will not be able to reestablish themselves in remaining above-pool

habitats which were filled to capacity before impoundment occurred. Furthermore, the loss of below-pool habitats will indirectly cause a decrease in the number of birds remaining in above-pool habitats. The greater a species' dependence on tree-shrub riparian or riverbank-flood-plain habitat, the greater the impact of impoundment on that species. Impoundment is estimated to cause a loss locally of nearly 14,000 birds in summer and over 30,000 birds in winter. Migrant birds did not utilize the lower Snake River Canyon habitats to a great degree, and thus will not be affected as much as resident birds. Since vertebrate species will be affected differently by habitat loss, population density will decline disproportionately. population density will decline disproportionately. Some species will be forced completely from the Some species will be forced completely from the area. All upland game birds will decrease after impoundment; Ring-necked Pheasants will be reduced the most because of this species' strong dependence upon the floodplain. Although Chukar partridge populations declined 46 percent from 1972 to 1973, this upland game bird will very probably maintain relatively high population densities in future years. The overall impact to vertebrates will be a high loss in numbers and a decrease in diversity. Opportunities for management in the area of Lower Granite Reservoir are very limited. The most productive soils are now in undated, and only shallow rocky soils extend above pool level. These shallow soils will not support high quality riparian and floodplain habitats, thus resulting in a permanently reduced and simthus resulting in a permanently reduced and sim-plified vertebrate fauna. W79-00146

SUMMARY OF STUDY FINDINGS, PHASE I REPORT: ECOLOGICAL EFFECTS OF HIGHWAY CONSTRUCTION UPON MICHIGAN WOODLOTS AND WETLANDS, Michigan State Univ., East Lansing. Dept. of Resource Development. For primary bibliographic entry see Field 4C. W79-00195

VEGETATION OF SOUTHEASTERN FLORIDA -- PARTS II - V, Florida Atlantic Univ., Boca Raton. Dept. of

Biological Sciences. For primary bibliographic entry see Field 21. W79-00196

WETLANDS AS A NAVAL ENVIRONMENTAL

CONCERN, Naval Academy, Annapolis, MD. Dept. of Political Science

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A045 360, Price codes: A02 in paper copy, A01 in microfiche. Report USNA-EPRD-24, Energy-Environment Study Group, U. S. Naval Academy, May, 1975, 14 p.

Descriptors: *Wetlands, *Census, *Military reservations, Data collections, Planning, Environment, Environmental effects.

Currently the Navy lacks basic numbers in terms Currently the Navy lacks basic numbers in terms of wetland acreage, miles of shoreline, much less a complete study of what it owns. It was intended that a data bank would be developed with this information, that could be used for storing and retrieving the data, which would be Navy oriented. Events such as oil spills, noise studies, and other information could be used as a device to identify potential pollution sources or explement for available. potential pollution sources or problems for navai installations. (Steiner-Mass) W79-00201

ON THE ENVIRONMENTAL EFFICIENCY OF

ECONOMIC SYSTEMS, Pennsylvania State Univ., University Park. R. J. McIntyre, and J. R. Thornton. Soviet Studies, Vol 30, No 2, p 173-192, April

Field 6-WATER RESOURCES PLANNING

Group 6G-Ecologic Impact Of Water Development

Descriptors: Economics, "Environmental effects, "Methodology, "Environmental convergence, "Soviet Union, "United States, "Pollution abatement, Public policy, Political aspects, Central planning, Institutions, Incentives, Air pollution, Water pollution, control, Legislation, Regulation, Pollutants, Gross national product, Theoretical

Evaluation of environmental efforts and policies of the Soviet Union, and comparison with similar data for the United States, demonstrates that environmental convergence theories are inconsistent with evidence and are methodologically incorrect. Such theories hold that environmental disruption will tend to be uniform among countries at simila levels of economic development regardless of na-tional political or institutional form. It is shown that data limitations and methodological difficul-ties which invalidate these theories also render ambiguous any empirical comparison of the overall environmental performance of two economies. In consequence, comparisons must be restricted to evaluations of the appropriateness of institutional forms and incentive structures which determine environmental performance. It is claimed that a centrally planned economy has built-in informational advantages that should make it more environmentally efficient. Evidence also suggests that Soviet implementation of abatement programs has been substantial, contrary to the implications of convergence theorists. The methodology of environmental convergence theorists is invalid because in appraising a country's environmental record, it fails to distinguish between the amount of environmental disruption in an economy and the environmental efficiency of an economic system. (Lynch-Wisconsin) W79-00230

CONCEPTUAL AND STATISTICAL ISSUES IN DEVELOPING ENVIRONMENTAL MEASURES - RECENT U.S. EXPERIENCE, Bureau of Economic Analysis, Washington, DC.

J. E. Cremeans.

The Review of Income and Wealth, No 2, p 97-115. June 1977, 1 tab

Descriptors: *United States, *Estimating, *Cost-benefit analysis, *Pollution abatement, *Methodology, *Costs, *Public policy, Benefits, Statistical methods, Economics, Water pollution control, Air pollution, Decision making, Expendi-tures, Administration, Bureau of Economic Anal-

Methods used by the Bureau of Economic Analysis (U.S. Department of Commerce) in estimating public and private spending for pollution abatement and control (PAC) are described. In 1972 the federal government began work on this project to assess costs and benefits of pollution abatement and control. Work since the project started in 1972 has been limited to: (1) pollution from harmful foreign substances, and (2) forms of energy discharged in production, distribution, and consumption. Estimates so far have dealt only with pollution costs, but evaluation of benefits of abatement and control also is scheduled. PAC concepts and definitions were designed to be compati-ble with national income accounts. The following terms are defined: pollution, pollution abatement, direct pollution abatement cost, indirect pollution abatement cost, and indirect benefits. A framework for presenting the data is developed, and expenditures for 1972 and 1973 are given. Total national expenditures for PAC were \$19.5 billion in 1972 and \$23 billion in 1973. These totals are broken down by air, water, and solid waste pollution. Estimates are also subdivided by administrative components: pollution abatement (personal consumption, business, and government), regulation and monitoring, and research and development. Each component is further subdivided. (Lynch-Wisconsin) W79-00232

VEGETATIVE STABILIZATION OF DREDGE SPOIL IN NORTH FLORIDA, Florida A and M Univ., Tallahassee. For primary bibliographic entry see Field 5G. W79-00337

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES TUNNEL SYSTEM.

Booz-Allen Applied Research, Bethesda, MD. For primary bibliographic entry see Field 5D.

7. RESOURCES DATA

7B. Data Acquisition

DETERMINATION OF TERRESTRIAL BEDO FROM LANDSAT I SATI IMAGERY IN PHOTOGRAPHIC FORM, SATELLITE Arizona Water Resources Research Center, Tuc-

Soil Science Society of America Journal, Vol. 41, p 835-838 1977. 2 fig, 3 tab, 9 ref. OWRT A-069. ARIZ(2), 14-34-0001-6003.

Descriptors: Remote sensing, *Albedo, Arizona, *Sonoita Creek basin(Ariz), *Photography, *Radiometry, Data collections, Soil reflectance, *LANDSAT1 imagery.

Satellite imagery taken from LANDSAT I were used to determine terrestrial albedo and its Sonoita Creek (31 degrees 45' N 110 degrees 43' W). A simple linear equation was derived to link the albedo with the optical density of the imagery. The modeling approach was based on the cyclic nature of the energy exchange between earth and space on the one hand and on the local density on the developed film as an output on the other ha The results showed acceptable agreement between photographic and radiometric method for albedo determinati W79-00012 ation

REMOTE WATER MONITORING SYSTEM, National Aeronautics and Space Administration, Washington, DC. (Assignee). D. C. Grana, and D. P. Haynes.

U.S. Patent No. 4,089,209, 10 p, 5 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 970, No 3, p 844, May 16, 1978.

Descriptors: *Patents, *Monitoring, *Sampling, Data collections, *Remote sensing, Floating, Data transmission, Electrochemical analysis.

A remote water monitoring system is described that integrates the functions of sampling, sample preservation, sample analysis, data transmission and remote operation. The system employs a floating buoy carrying an antenna connected by lines to one or more sampling units containing several sample chambers. Receipt of a command signal actuates a solenoid to open an intake valve outward from the sampling unit and communicates the water sample to an identifiable sample chamber. Such response to each signal receipt is repeated until all sample chambers are filled in a sample unit. Each sample taken is analyzed by an elec-trochemical sensor for a specific property and the data obtained is transmitted to a remote sending and receiving station. Thereafter, the samples remain isolated in the sample chambers until the sampling unit is recovered and the samples removed for further laboratory analysis. (Sinha-W79-00047

NONMETALLIC ELECTROFISHING BOOMS AND ACCESSORY TACKLE, Fish and Wildlife Service, Arkadelphia, AR.

T. O. Duncan. The Progressive Fish Culturist, 1978, Vol. 40(3), p 98-100. 1 tab, 3 fig, 6 ref.

Descriptors: On-site investigations, Laboratory equipment, "Zooplankton, Methodology
"Trawling, "Sampling, "Freshwater fish, Fish at tractants, Fishing gear, "Electrofishing, Fish populations, Non-metallic electrofishing booms.

The original strength and flexibility of nonmetallic (nonconducting) electrofishing booms were main-tained by building special tackle from which to hang the electrodes and to suspend the booms above the water. The booms and tackle functioned well in field operations, and since the booms are well in field operations, and since the booms are nonconducting, they reduce the potential hazards associated with electrofishing equipment. Epoxy resin poles filled with polyurethane foam were used instead of dimensional lumber, wooden dowels, hollow fiber glass poles, or aluminum tubing wrapped in fiber glass. (EIS-Katz) W79-00069

COLLECTION BUCKET FOR USE WITH TOW NETS FOR LARVAL FISH. Fish and Wildlife Service, Arkadelphia, AR.

T. O. Duncan.

The Progressive Fish Culturist, 1978, Vol. 40(3), p 118-119. 1 fig. 1 tab, 7 ref.

Descriptors: Methodology, *Monitoring, *Sampling, *Freshwater fish, Larvae, *Larval Descriptors: growth stages, Laboratory equipment, On-site investigations, Zooplankton, Juvenile fish, Nets, Trawling, *Fish populations, Collection bucket, Townet, Trawls.

A collection bucket is described for use with tow nets used to sample larval fish. The contoured bottom prevents organisms from lodging in corners when the bucket is emptied. Organisms can be washed off the bolting cloth with a wash bottle from the outside. (EIS-Katz)

SIMPLE VENTURI DEVICE FOR MIXING FRESHWATER AND SEAWATER IN AN ESTUARINE CULTURE SYSTEM, National Marine Fisheries Service, Auke Bay, AK. Auke Bay Fisheries Lab. W. R. Heard, and F. H. Salter.

The Progressive Fish Culturist, Vol. 40(3), July 1978, p 101-113. 1 tab, 1 fig, 4 ref.

Descriptors: *Aquaculture, Methodology, Freshwater, Sea water, *Laboratory equipment, *Bioassays, Salinity, Alaska, Laboratory tests, Estuaries, *Little Port Walter(Ala), Venturi iniected seawater.

A venturi device made from standard sizes of polyvinyl chloride plumbing and rod-stock materi-al was tested at Little Port Walter, an estuary in southeastern Alaska. When installed in a gravityfed freshwater delivery system, the venturi injected seawater into the discharge water to jected seawater into the discharge water to produce a stabe water flow of intermediate salinity. The use of interchangeable components with different-sized openings permits regulation of the salinity of the discharge water. (EIS-Katz) W79-00071

QUANTITATIVE COMPARISON OF SEINING AND UNDERWATER OBSERVATION FOR STREAM FISHERY SURVEYS, Argonne Natonal Lab. IL. R. M. Goldstein.

The Progressive Fish Culturist, Vol. 40(3), 1978, p 108-111. 2 tab, 1 fig. 8 ref.

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10(3), 1978, p

Descriptors: "Sampling, "Freshwater fish, "On-site investigations, Methodology, "Swimming, "Surveys, Nets, Monitoring, Fish populations, Fishing gear, Connecticut, Species occurrence, Relative abundance, Snorkel dives, "Snorkel sur-vey, "Seine survey, Hop River, Shetucket River, Natchaug River.

Species occurrence and relative abundance, as determined by direct observation (by snorkel divers) and by seine survey, were compared. Occurrence was compared for a single snorkel survey so collections made during 1 year, 3 months, and 1 day. At least as many species (and usually many more individuals) were identified during the snorkel survey as during the seine survey: however, not all species were identified by both methods. Species relative abundance, as judged by seine collections, may be biased toward the smaller species. (EIS-Katz)

ARTIFICIAL SUBSTRATE SAMPLER FOR BENTHIC INVERTEBRATES IN PONDS, SMALL LAKES, AND RESERVOIRS, Tennessee Technological Univ., Cookville. Dept. of Biology. D. Kathman.

The Progressive Fish Culturist 1978, Vol. 40(3), July 1978, p 114-115. 2 fig, 4 ref.

Descriptors: Methodology, *On-site investiga-tions, *Benthos, Ponds, Reservoirs, Lakes, *Invertebrates, Animal populations, *Sampling, Artificial substrate sampler, Benthic inver-

An artificial substrate for benthic invertebrate surveys is described. Organism wash-off during sam-ple retrieval is prevented by enclosing the basket in a polyester fabric skirt before raising it. (EIS-

APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC PLANNING, ECOsystems International, Inc., Gambrills, MD. H. Loats, Jr., T. Fowler, and P. Castruccio.

H. Loats, Jr., T. Fowler, and P. Castruccio. Available from the National Technical Information Service, Springfield, VA 22161 as NASA-CR-3041, Price codes: A07 in paper copy, A01 in microfiche. Report No. NASA Contractor Report 3041, August 1978. 138 p. 29 fig, 18 tab, 2 append. NAS8-32423.

Descriptors: *Remote sensing, *Hydrologic data, Water resources, *Water pollution, *Satellites(Artificial), *LANDSAT, Surveys, Watersheds(Basins), Planning, Model studies, Basins, Sub-basins, Land classification, Magothy River, Water pollution sources, Runoff, Rainfall-Runoff relationships.

A demonstration project illustrates the usefulness and accuracy of data obtained by remote sensing technology associated with the LANDSAT earth technology associated with the LANDSAT earth resources satellite in the field of water resources, especially on estimation of non-point source pollutant loads. LANDSAT images were used to classify land cover using optical analysis of multi-band, multi-temporal images. Classification accuracies for three small test watersheds were above 95%. For a fourth watershed, the Magothy River in Maryland, land cover was converted to pollutant had using a conflicted testing the statement of the control of th loads using coefficients relating significant pollutants to land use and storm runoff volume. These data were subsequently processed by the ECOsystems Hydrologic Simulator model which simulated runoff from average expected rainfall. This yielded an estimate of monthly expected pol-lutants loads for the 17 sub-basins of the Magothy watershed. Resuls were used by the Baltimore Re-gional Planning Council for its 208 area-wide waste water plan and the Council has indicated that these techniques are preferred for other watersheds in the region. (Majtenyi-IPA) W79-00099 THE PARTY OF TANKEN SOR POR PORTOR

SÓLID STATE EVENT RECORDER FOR RAIN-FALL MEASUREMENT, Institute of Hydrology, Wallingford (England). For primary bibliographic entry see Field 2B, W79-00125

HAILSTONE SIZE INFERRED FROM DENTS IN COLD-ROLLED ALUMINUM SHEET, Council for Scientific and Industrial Research, Pretoria (South Africa). National Physical Research Lab.
D. V. D. S. Roos.

Journal of Applied Meteorology, Vol. 17, No. 8, p 1234-1239, August 1978. 7 fig, 2 tab, 7 ref.

Descriptors: *Hail, *Measurement, *Particle size, Analytical techniques, Aluminum, Precipita-tion(Atmospheric), Weather, Cloud physics, Storms, Mathematical studies, Meteorology, Hailstones Hailstones size

The reflecting properties of microscopic corruga-tions on the surface of cold-rolled aluminum sheet used in hailpads led to a new technique for deter-mining the size of hailstones. Hailstone models of various shapes and sizes were used to produce dents in the sheet, for normal and oblique impacts. It was found that psi, the diameter (or equivalent spherical diameter) of hailstones, was related to mean d, the diameter of the characteristic shadow inside dents, such that psi = 0.6 mean d + 3 (for psi between 4 and 40 mm). The standard deviation of psi (for normal impacts) was found to be + or -8% for spheres of psi = 6 mm, + or - 5% for spheres of psi greater than 11 mm and between approximately + or - 6 and + or - 17% for nonspherical objects. Also, the value of mean d for nonspherical objects that impacted at angles of up to 50 deg was only about 10% larger than the corresponding value of mean d if the impact had been normal. An estimate of the kinetic energy of an impacting building the contractions of the contractions of the contractions. normal. An estimate of the kinetic energy of an impacting hailstone may be made from d. This method proved to be particularly suitable for recording actual hailfalls, and results thus obtained are discussed. (Sims-ISWS)

THE VERTICAL PLANAR MOTION MECHANISM; A DYNAMIC TEST APPARATUS FOR EVALUATING CURRENT METERS AND OTHER MARINE INSTRUMENTATION, National Ocean Survey, Rockville, MD. A. N. Kalvaitis.

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Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 571, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA-600/7-78-145, July 1978. 37 p, 7 fig, 2 tab, 4 append. EAP-78-BEA.

Descriptors: *Flow measurement, *Flowmeters Hydraulic design, "Hydraulic models, Fluid mechanics, Dynamics, Currents, Vertical Planar Motion Mechanism(VPMM), Flow, Dynamics, Hydraulic machinery, Instrumentation.

To aid in evaluating accuracy of current meters To aid in evaluating accuracy of current meters and other marine instruments, a dynamic test apparatus called a Vertical Planar Motion Mechanism (VPMM) was developed which is capable of generating three major modes, vertical-circular, vertical, and horizontal. Length scales range from 0.15 to 1.22 m and time scales vary from 5 to 12 seconds. The VPMM is mounted on a tow carriage which provides the steady velocity while the apparatus itself superimposes oscillatory motions on full-size current meters. The VPMM is instrumented so that the instantaneous velocities instrumented so that the instantaneous velocities of the test sensors and their outputs may be mea-sured at a 20-Hz sampling rate, and an on-board computer allows for near-real time data analysis. The development and wet acceptance testing of the VPMM is described using several types of cur-rent sensors, including electromagnetic and acoustic varieties. Performance of the apparatus was judged acceptable for all conditions investigated and no deleterious interactions were

noted between it and the test instruments. The NOTED DELIVER II and the test instruments. The VPMM provides a unique capability for testing and evaluating sensors at various combinations of length and time scale dynamics. Other anticipated uses for the VPMM include testing wave measurement systems, validating dynamic response models, and conducting stability tests on towed vehicles. (Majtenyi-IPA) W79-00224

REMOTE MONITORING OF COAL STRIP

MINE REHABILITATION, National Aeronautics and Space Administration, Slidell, LA. Earth Resources Lab. For primary bibliographic entry see Field 5G.

A COMPARISON OF CERAMIC AND TEFLON IN SITU SAMPLERS FOR PORE WATER DETERMINATIONS, Harbor Branch Foundation, Inc., Fort Pierce, FL.

For primary bibliographic entry see Field 5A. W79-00325

ELECTRIC RAINFALL INTENSITY SENSOR, State Univ. of New York at Albany. Dept. of Atmospheric Science. For primary bibliographic entry see Field 2B. W79-00329

SHUNT METERS WITH SEGMENTAL ORI-FICES, Colorado State Univ., Fort Collins. Dept. of Civil

Engineering.
For primary bibliographic entry see Field 3F.
W79-00335

AGRICULTURAL AND HYDROLOGICAL AP-PLICATIONS OF RADAR: FINAL REPORT, Kansas Univ. Space Technology Center, Lawrence, Remote Sensing Lab. F. T. Ulaby.

Available from the National Technical Information Service, Springfield, VA 22161 as N77-12243, Price codes: A05 in paper copy, A01 in microfiche. Technical Report 177-62, July 31, 1976. 90 p, 2 append. NASA NAS9-10261.

Descriptors: *Remote sensing, *Radar, *Bibliographies, Data processing, Application methods, Equipment, Instrumentation, Geology, Agriculture, Forestry, Hydrology, Soils, Soil types, Soil moisture, Snow, Oceanography, Abstracts, Publications, Documentation.

This was the final report of the research per-formed under NASA contract NAS 9-10261 covering the period 15 August 1969 to 31 July 1976. During the initial disciplines and activities in radar remote sensing, including radar systems develop-ment and analysis, data processing and display, and data interpretation in geology, geography, and oceanography. Between 1972 and the termination date of the contract, the research was focused on the evaluation of radar remote sensing applications in hydrology and agriculture based on data acquired with the Microwave Active Spectrometer (MAS) system. Due to the large volume of information generated under this contract, the titles of the reports summarizing the work were grouped by subjects. Radar remote sensing was divided into three major areas of activity: (1) Radar System Studies, (2) Data Processing and Display, and (3) Geoscience Applications. Each area was subdivided on the basis of specialization within that area. Appendix A contained abstracts of all 62 technical reports generated under this contract. Appendix B contained a sequential list of the titles of these reports. (Sims-ISWS) W79-00464

Group 7B—Data Acquisition

SAMPLER ACTIVATION AND RECORDING SYSTEM.

North Carolina State Univ. at Raleigh. Dept. of Biological and Agricultural Engineering. F. A. Koehler, F. J. Humenik, E. P. Harris, and J. C. Barker.

C. Barker.

Journal of the Euvironmental Engineering Division, American Society of Civil Engineers, Vol. 104, No. E85, Technical Note, p. 1032-1035, October 1978. 3 fig, 1 ref., 1 append. EPA R803328.

Descriptors: "Water sampling, "Instrumentation, "Automation, "Control systems, Sampling, Streamflow, Hydrology, Hydrographs, Automatic control, Research equipment, Water measurement, Sampling activation, Recording systems.

A simple sampler activating device that resulted in automated sample procurement and simultaneous automated sample procurement and simultaneous hydrograph time-stage notation was developed as part of a project to assess the impact of rural non-point sources on an areawide basis. The total instrumentation for continuous gaging and automated sampling was battery operated because sampling sites were in rural areas. The sampler selected (ISCO Model 1392, Instrumentation Specialities Company, Lincoln, Nebraska) may be activated on a time or flow basis, and the actual sampling interval can be a multiple (up to 12) of the oripling interval can be a multiple (up to 12) of the pripling interval can be a multiple tup to 12/01 the primary interval. A continuous analog state record was obtained using a Freiz Model AU stage recorder. Results of 18 months of field use have been favorable. Significant improvements that have accrued from the use of this system as opportunities interval against ages [1], samples have accrued from the use of this system as op-posed to time interval sampling are: (1) samples are taken in response to hydrologic changes in the stream, when greatest changes in stream chemis-try are expected; (2) repetitive samples under steady-state flow conditions are eliminated, reducing the analytical laboratory workload; (3) streamflow and water chemistry are measured concur-rently, allowing more precise calculation of constituent transport; (4) no prior knowledge or as-sumptions of the hydrologic response time of the stream is necessary in order to adequately charac-terize a runoff event; and (5) all streamflow regimes are sampled, small and large runoff events as well as baseflow recession, in proportion to the expected changes in water chemistry. expected changes (Humphreys-ISWS)

7C. Evaluation, Processing and Publication

WASOPT USERS MANUAL: AN INTEGER PRO-GRAMMING METHODOLOGY FOR MU-NICIPAL/REGIONAL WATER SUPPLY PLANNING, Utah Water Research Lab., Logan.

For primary bibliographic entry see Field 6A. W79-00002

A TECHNIQUE FOR ESTIMATING CLOCK TWO-HOURLY PRECIPITATION RATE DIS-TRIBUTIONS.

Air Force Environmental Technical Applications Center, Scott AFB, IL. For primary bibliographic entry see Field 2B. W79-00089

APPLICATIONS OF REMOTE SENSING TO HYDROLOGIC PLANNING, ECOsystems International, Inc., Gambrills, MD.

For primary bibliographic entry see Field 7B. W79-00099

USER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. APPENDIX

Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00189

PROGRAMMER'S MANUAL FOR EXPLORE-I: A RIVER BASIN WATER QUALITY, APPENDIX

Battelle Pacific Northwest Lab., Richland, WA. For primary bibliographic entry see Field 5B. W79-00190

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX

Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F. W79-00192

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX III-PROJECT DATA. Bureau of Reclamation, Washington, DC. Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F. W79-00194

DATA BASE SYSTEM FOR STATE WATER QUALITY MANAGEMENT INFORMATION SYSTEM.

Pennsylvania Dept. of Environmental Resources, Harrisburg. Bureau of Water Quality Manage-

For primary bibliographic entry see Field 5G. W79-00222

REMOTE MONITORING OF COAL STRIP MINE REHABILITATION,

National Aeronautics and Space Administration, Slidell, LA. Earth Resources Lab. For primary bibliographic entry see Field 5G. W79-00226

YELLOWSTONE NATIONAL PARK SURVEY MAY-AUGUST 1970, INCLUDES SODA BUTTE SURVEY, MAY-OCTOBER 1969.

Environmental Protection Agency, Kansas City, MO. Region VII. For primary bibliographic entry see Field 5A. W79-00250

MAPS SHOWING WATER-LEVEL DECLINES, LAND SUBSIDENCE, AND EARTH FISSURES IN SOUTH-CENTRAL ARIZONA.

Geological Survey, Tucson, AZ. Water Resources
Div.; and Bureau of Reclamation, Phoenix, AZ.
Arizona Dept. of Transportation, Phoenix. R. L. I.aney, R. H. Raymond, and C. C. Winikka. Water-Resources Investigations 78-83 (open-file report), June 1978. 2 sheets, 20 ref.

Descriptors: *Groundwater, *Overdraft, *Water level fluctuations, *Land subsidence, level fluctuations, *Land subsidence,
*Fissures(Geologic), Maps, Aquifers, Water
wells, Pumping, Drawdown, Land use, Water demand, Urbanization, Evaluation, *Arizona, Pinal County, Maricopa County.

From 1915 to 1975, more than 109 million acre-feet of ground water was withdrawn from about 4,500 square miles in Pinal and Maricopa Counties in south-central Arizona. The volume of water withdrawn greatly exceeds the volume of natural recharge, and water levels have been declining since 1923. As a result of the water-level declines, the land surface has subsided, the alluvial deposits have been subjected to stress, and earth fissures have developed. Land subsidence and earth fis-sures have damaged public and private properties. Subsidence and fissures will continue to occur as long as ground water is being mined and water levels continue to decline. As urban development expands, land subsidence and earth fissures will have an increasing socioeconomic impact. Information on maps includes change in water levels, measurements of land subsidence, and location of earth fissures. A section showing land subsidence between Casa Grande and the Picacho Peak In-terchange also is included. Scale 1:250,000. (Woodard-USGS) W79-00251

GROUNDWATER QUALITY ATLAS OF

NEBRASKA, Geological Survey, Lincoln, NE. Water Resources Div.; and Nebraska Univ. Conservation and Sur-vey Division, Lincoln.

vey Division, Lincoln.
R. A. Engberg, and R. F. Spalding.
Nebraska Conservation and Survey Division,
University of Nebraska: Resource Atlas No. 3,
1978. 39 p., 20 fig., 1 tab., 32 ref.

Descriptors: *Water quality, *Groundwater, *Nebraska, *Maps, *Chemical analysis, Sampling, Sites, Aquifer management, Geochemistry, Chemical reactions, Water analysis, Dissolved solids, Alkalinity, Hardness(Water), Sodium, Potassium, Sulfates, Chlorides, Fluorides, Boron, Silica, 'Iron, Manganese, Phosphorus, Nitrates, Trace elements, Selenium.

This atlas contains a series of maps describing the chemical quality of the ground water of Nebraska. Each map depicts the quality of water in only the principal aquifer in each area of the State; no attempt was made to differentiate water from different the series of the state of the series of the s ferent geologic sources. Maps showing zones of concentration of 13 chemical constituent or comconcentration of 13 chemical constituent or com-binations of constituents are presented along with accompanying maps of sampling sites. The 13 con-stituents are dissolved solids, hardness as CaCO3, solidam plus potassium, alkalinity as CaCO3, sulfate, chloride, fluoride, silica, boron, iron, manganese, selenium, and phosphorus. A map showing constituent sampling-site maps is presented for the trace constituents arsenic, cad-mium, chromium (hexavalent), copper, lead, silver, and zinc. Another map shows nitrate sam-pling sites and two areas where ground water con-cains high-nitrate concentrations. Descriptive pling sites and two areas were ground water con-tains high-nitrate concentrations. Descriptive matter concerning source and occurrence of each constituent is included on pages facing the respec-tive maps. Short descriptions of each of 13 un-derground-water areas also are given. (Woodard-W79-00252

GROUND-WATER DATA, 1974-76, INDIAN WELLS VALLEY, KERN, INYO, AND SAN BERNARDINO COUNTIES, CALIFORNIA, Geological Survey, Menio Park, CA. Water Resources Div.

C. E. Lamb, and D. J. Downing. Open-file report 78-335, July 1978. 42 p, 3 fig, 1 plate, 3 tab, 5 ref.

Descriptors: "Groundwater resources, "Water wells, "Pumping, "Water yield, "Water levels, Water quality, Data collections, Water level fluc-tuations, California, "Indian Wells Valley, "Kem County, "Inyo County, "San Bernardino County.

Water-level measurements were made annually in 115 wells in Indian Wells Valley, Kern, Inyo, and San Bernardino Counties, Calif., in 1974-76. In the Inyokern area the average water-level decline was 2.0 ft for two wells between October 1973 and November 1976. In the intermediate area the average decline was 6.2 ft for five wells between October 1973 and December 1976. In the Ridgecrest area the average decline was 4.5 ft for four wells between October 1973 and December 1976 but was 10.3 ft for one well during the same 1976 but was 10.3 ft for one well during the same period. Reported metered ground-water pumpage from Indian Wells Valley totaled 14,400 acre-ft in 1974, 14,500 acre-ft in 1975, and 14,100 acre-ft in 1976. These figures may not completely reflect the total pumpage from the basin due to changing paterns of land use and new pumping sources. Chemical analyses were made of 102 water samples collected from 42 wells during 1974-76. The analyses show large variance of quality of ground water in Indian Wells Valley. (Woodard-USGS) W79-00

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HYDROGEOLOGIC RECONNAISSANCE OF THE MEKONG DELTA IN SOUTH VIETNAM AND CAMBODIA,

Resources Div.

H. R. Anderson.

Available from the Supt. of Documents, GPO, Washington, DC 20402, Price \$2.50. Water-Supply Paper 1608-R, 1978. 24 p, 3 fig, 3 plates, 7 ref.

Descriptors: "Available water, "Surface waters, "Groundwater resources, "Water quality, Hydrology, Hydrogeology, Aquifer characteristics, Test wells, Hydrologic data, Maps, Evaluation, Foreign countries, "South Vietnam, "Cambodia, "Mekong Delta.

The report describes the general hydrogeology of the Mekong Delta and the adjacent region in South Vietnam and Cambodia, summarizes the results of exploratory wells in the delta from depths of 50 to 568 meters, and the general availability of ground water for rural and municipal water supply in the 15-tinh (province) region of the delta in South Vietnam. The ground-water conditions in five areas of the Mekong Delta are described. Included are descriptions of the hydrologic features and geologic setting of the Mekong Delta and adjacent region, the aquifers in the deltaic alluvial complex, and the quality and quantity of water available from individual aquifers. (Woodard-USGS)

GROUND-WATER LEVELS IN WYOMING, 1977,
M. D. Stevens.

Open-file report 78-605, 1978. 203 p, 21 fig, 6 ref.

Descriptors: *Groundwater, *Water levels, *Wyoming, *Observation wells, *Water level fluctuations, Hydrographs, Sites.

Ground-water levels are measured periodically in a network of about 290 observation wells in Wyoming to record changes in ground-water storage. The areas of water-level observation are mostly where ground water is used in large quantities for irrigation or municipal purposes. This report contains maps showing location of observation wells and water-level changes from 1977 to 1978. Well history, highest and lowest water levels, and hydrographs for most wells are also included. (W ooodard-USGS) W79-00259

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 2. SUSQUEHANNA AND POTOMAC RIVER BASING

Geological Survey, Harrisburg, PA. Water Resources Div. Available from the National Technical Informa-

Available from the National Technical Information Service, Springfield, VA 22161 as PB-285 754, Price codes: A17 in paper copy, A01 in microfiche. Water-Data Report PA-77-2, June 1978. 384 p, 7 fig, I tab.

Descriptors: *Pennsylvania, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Siter, *Susquehanna River basin, *Potomac River basin.

Water resources data for the 1977 water year for Pennsylvania consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, volume 2 (Susquehanna and Potomac River basins), contains discharge records for 96 gaging stations; stage and contents for 10

lakes and reservoirs; water quality for 36 gaging stations, 8 partial-record stations, and water levels for 32 observation wells. Also included are 24 crest-stage partial-record stations and 48 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS) W79-00265

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 1. DELAWARE RIVER BASIN.

Geological Survey, Harrisburg, PA. Water Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-286 880, Price codes: A16 in paper copy, A01 in microfiche. Water-Data Report PA-77-1, June 1978. 367 p, 12 fig. 4 tab.

Descriptors: "Pennsylvania, "Hydrologic data, "Surface waters, "Groundwater, "Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, "Delaware River basin.

Water resources data for the 1977 water year for Pennsylvania consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, volume 1 (Delaware River basin), contains discharge records for 82 gaging stations; stage and contents for 10 lakes and reservoirs; water quality for 34 gaging stations, 41 partial-record stations, and water levels for 16 observation wells. Also included are 42 crest-stage partial-record stations and 38 low-flow partial-record stations and 38 low-flow partial-record stations. Additional water data were collected at various sites, not involved in the systematic data-collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS)

WATER RESOURCES DATA FOR WISCONSIN, WATER YEAR 1977. Geological Survey, Madison, WI. Water

Resources Div.
Water-Data Report WI-77-1, May 1978. 626 p, 13

Descriptors: "Wisconsin, "Hydrologic data, "Surface water, "Groundwater, "Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Wisconsin include records of streamflow at gaging stations, partial-record stations, and miscellaneous sites; records of reservoir storage, records of chemical, physical and biological characteristics of surface water, ground water, and precipitation, and records of water levels in observation wells. Records for a few gaging stations in bordering States also are included. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Wisconsin. (Woodard-USGS) W79-00267

WATER RESOURCES DATA FOR PENNSYL-VANIA, WATER YEAR 1977--VOLUME 3. OHIO RIVER AND ST. LAWRENCE RIVER BASINS. Geological Survey, Harrisburg, PA. Water Resources Div. Water-Data Report PA-77-3. June 1978, 277 p. 6.

Water-Data Report PA-77-3, June 1978. 272 p, 6 fig.

Descriptors: "Pennsylvania, "Hydrologic data, "Surface waters, "Groundwater, "Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites, "Ohio River basin, "St. Lawrence River basin," St. Lawrence River basin.

Water resources data for the 1977 water year for Pennsylvania consist of records of stage, discharge and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels and water quality of ground water. This report, volume 3 (Ohio River and St. Lawrence River, basins), for 96 gaging stations; stage and contents for 22 lakes and reservoirs; water quality for 13 gaging stations and water levels for 20 observation wells. Also included are levels for 20 observation wells. Also included are levels for 20 observations wells. Also included are levels for 20 observations. Additional water data were collected at various sites, not involved in the systematic data collection program, and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Pennsylvania. (Woodard-USGS)

WATER-RESOURCES APPRAISAL OF THE WET MOUNTAIN VALLEY, IN PARTS OF CUSTER AND FREMONT COUNTIES, COLORADO, Geological Survey, Denver, CO. Water Resources

Div.

For primary bibliographic entry see Field 4B. W79-00274

POTENTIOMETRIC SURFACE MAP OF THE FLORIDAN AQUIFER IN THE ST. JOHNS RIVER WATER MANAGEMENT DISTRICT AND VICINITY, FLORIDA, SEPTEMBER, 1977, Geological Survey, Orlando, FL. Water Resources Div.

F. A. Watkins, C. P. Laughlin, and E. C. Hayes. Water-Resources Investigations 78-69 (open-file report), 1978, 1 sheet.

Descriptors: *Groundwater, *Potentiometric level, *Wet seasons, *Maps, *Hydrogeology, Aquifers, Florida, *St. Johns River Water Management.

This map presents the potentiometric surface of the Floridan aquifer in the St. Johns River Water Management District and vicinity for September 1977. The Floridan aquifer is the principal source of potable water in the area. Water-level measurements were made on approximately 900 wells and springs. The potentiometric surface is shown by 5-foot contours except in the Fernandina Beach area where 10- and 20-foot contours are used to show the deep cone of depression. This is the first map covering the entire St. Johns River Water Management District and vicinity for September, a high water-level period. The potentiometric surface ranged from 130 feet above mean sea level in Polk County to 131 feet below sea level in Nassau County. (Woodard-USGS) W79-00275

SPECIES DIVERSITY INDICES OF THE FISH POPULATIONS OF STREAMS DRAINING SELECTED TEST AREAS ON EGLIN AIR FORCE BASE RESERVATION FLORIDA, Air Force Armament Lab., Eglin AFB., FL. R. C. Crews.

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

Available from the National Technical Informa-tion Service, Springfield, VA 22161 as ADA-035 592, Price codes: A03 in paper copy, A01 in microfiche. Report AFATL-TR-76-145, 50 p, December 1976. 25 fig, 2 tab, 6 ref, append.

Descriptors: *Darters, *Streams, Fish popula-tions, Freshwater fish, Habitats, Aquatic environ-ment, Aquatic populations, Statistical methods, Mathematic studies, On-site collections, Water pollution effects, *Diversity, *Species diversity, *Species diversity indices, Endangered species.

A baseline study of fishes was conducted in streams draining various test ranges currently used for testing and evaluation of conventional munitions. The purpose of the effort was to determine a species diversity index for each of the streams to used for comparison data in future studies and for use in environmental documentation. Twentythree species of fishes and one lamprey species were collected or observed. All specimens were preserved and catalogued for placement in the Air Force Armament Laboratory's fish reference collection. Many streams sampled serve as the habitat for an endangered species, the Okaloosa darter. One hundred and fifteen specimens of the Okaloosa darter were observed and released unharmed. (EIS-Deal) W79-00277

DYNAMIC PROGRAMMING AND THE PRIN-CIPLE OF OPTIMALITY: A SYSTEMATIC AP-

PROACH, Princeton Univ., NJ. Dept. of Civil Engineering. For primary bibliographic entry see Field 6A.

8. ENGINEERING WORKS

8A. Structures

COMPUTING TWO-DIMENSIONAL DAM-

BREAK FLOOD WAVES, California Univ., Davis. Dept. of Land, Air and Water Resources

N. Katopodes, and T. Strelkoff.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, p 1269-1288, September 1978. 8 fig. 14 ref, 2 append.

Descriptors: *Dam failure, *Flood waves, flow, models, *Unsteady flow, Dams, Computers, Model studies, *Method of characteristics, Wave propagation, Inundation, Wave

A mathematical model of two-dimensional unsteady flow through a breached dam was developed. The numerical method of characteristics in three independent variables was used to construct an algorithm correct to second order with respect to time. The solution progresses at specified time intervals. At any time, the flow con ditions are obtained by extending characteristic conoids back to a previously computed time plane and allowing information to propagate along the curvilinear rays of these conoids. Both the negative wave propagating into the reservoir and the jet emerging from the breach and eventually inundating the valley downstream of the dam were modeled in detail. Arbitrary dam geometry and channel topography can be taken into account. Propagation of the wave fronts was simulated by a computational grid moving with time. The exact computed resuls of the model were presented graphically as axonometric projects for the depth and as plan-view, two-dimensional vector fields for the flow velocities. (Singh-ISWS)

A MATHEMATICAL MODEL FOR SIMULAT. ING WATER DEMAND-SUPPLY AND ENERGY
USES FOR THE STATE OF PENNSYLVANIA,
Pennsylvania State Univ., University Park. Pennsylvania St H. H. Martinez.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 154, Price codes: A07 in paper copy, A01 in microfiche. Master of Science thesis, March, 1978. 122 p, 10 fig. 32 tab, 22 ref, append. OWRT A-048-PA(2), 14-34-0001-7080.

Descriptors: *Energy, *Water resources, *Water policy, Pennsylvania, Planning, *Linear flow model, *Energy policy, *Energy crisis, *Water/energy demand, *Water/energy system, *Water/energy policy, Socio-economic development, Supply-demand, Energy production model.

The high level of socio-economic development of society has been accompanied by high increments in water/energy demand. Since the recent energy crisis and the realization that there are severe limitations on raw energy and water resources, there has been a change in the thrust of water/energy policy toward the development of new domestic energy sources and better use con-trols for water resources. A linear Flow Model, as a mathematical tool, can be used to simulate different situations of water/energy supply-demand response to energy demand changes in order to make easier the planning and control of energy production in some optimal mode. Preliminary models of water supply-demand in Pennsylvania were established using Linear Flow Model methodology and use of these models to depict the operation of the Pennsylvania water/energy system was illustrated. The models will also be used to explore water/energy policy alternatives through impact studies. (Sink-Penna) W79-00442

8B. Hydraulics

CHARACTERISTICS OF MECHANICAL.

DEBRIS FLOW, Kyoto Univ. (Japan). Disaster Prevention Research Inst. For primary bibliographic entry see Field 2J. W79-00117

SCOUR OF BED MATERIAL IN VERY ROUGH CHANNELS Technical Univ. of Istanbul (Turkey). Dept. of

Hydralic and Water Power. For primary bibliographic entry see Field 2J. W79-00122

MEASUREMENTS OF RED LOAD IN OSCILLA. TORY FLOW.

Cambridge Univ. (England). Dept. of Engine For primary bibliographic entry see Field 2J.

WATER WELL DEVELOPMENT DECISIONS,

Texas A and I Univ., Kingsville. Dept. of Civil and Mechanical Engineering. M. M. Truitt.

Public Works, Vol. 109, No. 8, p 83, August, 1978. I fig. 3 ref.

Descriptors: *Well development, *Gravel packs, *Well screens, *Well design, Specifications, Water wells, Design criteria.

Three important decisions in water well design ar construction are: (1) Is a gravel pack needed; (2) If so, what size gradation should be specified; and (3) what size well screen is proper. A gravel pack is needed if the effective size or tenth percent of the water bearing sand is less than 0.01 inch. The gravel pack must have voids small enough to keep sand from passing through the well screen into the

well yet have sufficiently permeability. The mean grain size of the gravel pack should be 4 or 5 times the mean grain size of the formation (water sand), and the uniformity coefficient or the ratio of the sixtieth percantile to the tenth percantile should be between 2.0 and 2.5. The slot size of the screen should retain between 85 and 100 percent of the filter material. (Purdin-NWWA)
W79-00167

DIGGING FOR NEW SOURCES OF ENERGY.
Drilling-DCW, Vol. 39, No. 12, p 134, September,

Descriptors: *Geothermal studies, *T water, Gulf coastal plain, Methane, Drilling

General Curde Oil Co. and the U.S. Department of Energy will spend up to \$8 million on the first geopressured geothermal test well. At a target depth of 16,500 ft., researchers hope to find large bodies of overpressured hot water trapped in sedimentary layers which can be used for electric power generation. In addition, the hot water may contain as much as 82 trillion cu. ft. Gulf Coast is one of several projects around the country. Other geothermal experimental drilling can be found on the U. S. East Coast and in Idaho. (Purdin-NWWA) W79-00175

REGIONAL GEOLOGY SERIES: PART VII, THE COLORADO PLATEAU, National Water Well Association, Worthington, OH

H. W. Heiss.

Water Well Journal, Vol. 32, No. 10, p 53-64. 1 fig.

Descriptors: *Groundwater, *Regional analysis, *Water wells, *Drilling, *Colorado Plateau, Geology, Climates, Aquifers, Water yield, Water quality, Southwest U.S.

The Colorado Plateaus region is comprised of in-dividual plateaus of faulted, deeply-croded sedi-mentary rocks. Climate is arid to semiarid since precipitation varies with topography. Altitudes with sufficient precipitation are too cold for rais-ing crops, and irrigation is necessary in warmer areas. Ground water reservoirs are mostly sand-stone and limestone but a few wells top alluvial and deposits and basalt. Many wells must be drilled through several hundred feet of unsatu-rated rock due to drainage of ground water into canyons and low permeability of sandstone. In Gallup, New Mexico, domestic and municipal wells 200-1000 ft. deep are drilled with cable-tool rigs into sandstone at rates averaging 120-350 ft. deep into sandstone which yield 25 to 40 gpm of water containing moderate iron. In Camp Verde, Arizona, domestic wells are drilled 60 to 300 feet through alluvium and cavernous limestone. areas. Ground water reservoirs are mostly sand-Arizona, domestic wells are drilled 60 to 300 feet through alluvium and cavernous limestone. Boulder fields and caving sands are two problems encountered in this area. Acid ground water occurs in nearby Corville, Arizona. In Flagstaff, Arizona, large industrial wells 400 to 500 ft deep yield at least 1000 gpm, and some yield 3500 gpm of good quality water. (Purdin-NWWA) W79-00177

NEW APPROACH GETS RESULTS IN UTAR

Indian Health Service, Phoenix, AZ. Office of Environmental Health. R. E. Hatten.

Johnson Drillers Journal, Vol. 50, No. 4, p 5-7, July-August, 1978. 2 fig.

Descriptors: *Groundwater, *Water supply development, *Water wells, Infiltration galleries, Caissons, Well screens, Well filters, Utah.

In an area near the borders of Arizona, New Mexico, and Utah most domestic water requirements is obtained from ground water. A chronic problem in

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S IN UTAH Office of En-

No. 4, p 5-7,

ater supply tion galleries, Utah.

na, New Mexequirements is

this area is loss of production due to clogging of well screens by sand and silt. To overcome this problem, the U. S. Public Health Service and the Navajo Engineering and Construction Authority designed a radically different well. An 8-foot wide designed a radically different well. An 8-foot wide by 16-foot long caisson was constructed and two collection galleries were dug from the caisson to a nearby river. A non-woven fabric, designed for an above-ground septic tank leach field, was used as a filter medium for the collection galleries. Entrance velocity was reduced from one-tenth to less than one-hundredth of a foot per second. A 6-inch PVC well screen was selected and a 10-20 gravel was used. The well produced 1000 gpm for 72 hours, at which time drawdown had stabilized. This indicated that the well would satisfy the companity's needs for a less the next 10 years. munity's needs for at least the next 20 years.
(Purdin-NWWA)
W79-00181

FUNCTIONS AND PROPERTIES OF DRILLING For primary bibliographic entry see Field 8G. W79-00186

THE VERTICAL PLANAR MOTION MECHANISM; A DYNAMIC TEST APPARATUS FOR EVALUATING CURRENT METERS AND OTHER MARINE INSTRUMENTATION, National Ocean Survey, Rockville, MD. For primary bibliographic entry see Field 7B. W79-00224

THREE-DIMENSIONAL OPEN CHANNEL FLOW, Pittsburg Univ., PA. Dept. of Civil Engineering. C. L. Chiu, D. E. Hsiung, and H. C. Lin. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. Hy8, p 1119-1136, August 1978. 11 fig. 1 tab, 4 ref, 2 ap-

Descriptors: *Alluvial channels, *Hydraulics, *Open channels, *Open channel flow, Unsteady flow, Fluid mechanics, Mathematical studies, Equations, Three-dimensional flow, Secondary flow, Hydrodynamic equations.

An open channel flow is usually three-dimensional, consisting of the primary and secondary flows. The primary flow was defined herein as the flow component in the longitudinal direction of the channel, while the secondary flow includes the remaining flow components in the vertical and transverse directions of the channel. In an alluvial channel, the channel cross sections and, thus, the three-dimensional flow structure vary irregularly or randomly along the flow. A technique was developed and presented herein that can be used to compute secondary currents and, thus, the irregular three-dimensional structure of open channel flow. The technique uses analytical,
hydrodynamic equations along with measured data
of channel geometry and primary flow velocity
distribution. Illustrative examples were presented with results of practical applications of the technique, describing the variability of the direction and magnitude of secondary currents with time, space, and discharge rate. (Lee-ISWS) W79-00312

NUMERICAL STUDY OF CONTINUOUS SAL-

TATION, New South Wales Univ., Kensington (Australia). School of Mechanical and Industrial Engineering.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 14030, p 1305-1321, September 1978. 12 fig. 15 ref.

Descriptors: *Bed load, *Saltation, *Numerical analysis, Hydraulics, Hydrodynamics, Particle shape, Particle size, Sedimentation, Flow,

Reynolds number, Mathematical studies, *Particle trajectories, Solids flow.

Continuous saltation is understood to occur when a particle in a horizontally flowing fluid rebounds repeatedly from the bed of a flume without being deposited. The motion of an isolated spherical particle near a bed of similar particles in an orderly horizontal array was simulated numerically. A three-dimensional model based on coefficients of restitution and friction was developed for the bed interaction with the moving particle. It was shown that the upward component of the drag force on a downward moving particle can be greater than the net gravitational force on that particle. For different values of the relative particle density, the net gravitational force on that particle. For dif-ferent values of the relative particle density, the results for average height of bounce, average par-ticle horizontal velocity, and rate of solids trans-port cannot be reduced to a single well-ordered family of curves when the Shields entrainment function and the particle Reynolds number are used as independent parameters. The results can be correlated if these parameters are each mul-tiplied by a factor containing the relative particle density. (Lee-ISWS) W79-00314

AIR ENTRAINMENT IN RADIAL FLOW TOWARDS INTAKES, Government Coll. of Engineering and Technology, Raipur (India). Dept. of Civil Engineering. A. K. Jain, K. G. R. Raju, and R. J. Garde. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY9, Proceedings Paper 14038, p 1323-1329, September 1978. 3 fig. 3 ref.

Descriptors: *Air entrainment, *Intakes, *Flow, Intake structures, Froude number, Hydraulics, Hydraulic structures, Reservoirs, Viscosity, Water circulation, *Radial flows, Vertical pipe in-

The aim of this paper was to understand clearly the role of the different parameters on vortex formation. A study was made where the vanes for circulation are radial and thus the approach flow is free from circulation. Air entrainment in radial flow at intakes occurs when the submergence is greatly reduced, and the flow is of the gulping type with the liquid surface above the intake pulsating. It was shown by experimentation that the critical st was shown by experimentation that the critical submergence is practically independent of the viscosity, as well as the surface tension of the liquid. In radial approach flow towards vertical pipe intakes, the safe submergence to prevent air entrainment always must be greater than the value predicted by the proposed equation for ranges of the Froude number between 1.1 and 20. (Lee-ISWS) W79-00315

PRESSURE FLUCTUATIONS BENEATH SUB-MERGED JUMP, University of Manchester Inst. of Science and

Technology (England). Dept of Civil and Structural Engineering. R. Narayanan.

R. Narayanan.

Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol. 104, No. HY9,
Proceedings Paper 14039, p 1331-1342, September
1978. 9 fig, 1 tab, 12 ref, 2 append.

Descriptors: "Hydraulic jump, "Submergence, "Flumes, "Pressure, "Fluctuations, Hydralics, Jets, Laboratory tests, Froude number, Non-uniform flow, Viscosity, Velocity, Stability, "Submerged jump, "Pressure fluctuations, Efflux depth, Unstable disturbances.

Wall pressure fluctuations were measured beneath a hydraulic jump that was completely submerged. Two efflux velocities, 3.3 m per s and 2.6 m per s, were used; the corresponding Froude numbers were 9.8 and 7.7, respectively. For a distance of 42 times the efflux depth, the intensity of the fluctuations si 4 to 7 times that beneath a turbulent boundary layer. It declines only slowly with downstream distance. Inertial scaling brings together the spectra for the velocities at higher frequencies. Evidence was presented for the contribution of the fluctuations due to the unsteadiness of the mass of water in which the jet spreads. The inviscid instability of the submerged hydraulic jump was investigated. There was agreement between the dominant frequency of pressure fluctuations beneath the submerged hydraulic jump and the frequency of the most unstable disturbances predicted by the theory. (Singh-W79-00316

SEVEN PROBLEMS IN BUBBLE AND JET DROP RESEARCHERS, State Univ. of New York at Albany. Atmospheric Sciences Research Center.
D. C. Blanchard, and L. D. Syzdek Limnology and Oceanography, Vol. 23, No. 3, p 389-400, May 1978. 2 fig, 1 tab, 30 ref.

Descriptors: "Air-water interfaces, "Bubbles, "Drops(Fluids), Laboratory tests, Analytical techniques, Bacteria, Jets, Equipment, Methodogy, Physics, Water properties, Physical properties, Limnology, Oceanography, Laboratory techniques, Bubbles bursting, Jet drops.

Four of the problems deal with the mechanics of bubble production and bursting, and the collection and sizing of jet drops:; three concern the transfer of the bacterium Serratia marcescens from bursting bubbles to jet drops. The problem of producing bubbles of a specified size from glass capillary tips is overcome by paying careful attention to tip geometry. Problems associated with bubble burst-ing have not been solved, but it is believed that they are caused by small differences in the position of the bubble relative to the interface at time of bursting. The collection and sizing of jet drops can cause problems, but suggestions were given to overcome them. Of the three problems involving bacteria, only the last appears to have a satisfactory solution. Experiments showed that the concentration of bacteria is always highest in the top jet drop of the jet and decreases progressively in the lower drops, being lowest in the bot-tom drop. This is in qualitative agreement with the hypothesis of jet drop formation advanced by MacIntyre (Sims-ISWS) W79-00319

EDDY PRODUCTION INSIDE WALL LAYERS. Universidad Nacional Autonoma de Mexico, Mexico City. Dept. of Ingeniera. E. Levi.

Journal of Hydraulic Research, Vol. 16, No. 2, p 107-122, 1978. 10 fig, 41 ref.

Descriptors: *Boundary layers, *Eddies, *Vortices, *Viscous flow, *Shear drag, Fluid mechanics, Flow, Reynolds, Turbulence, Water circulation, Wals, *Wale trails, Wall layers, Dragreducing flows, Streamwise eddies.

Turbulent eddies created inside wall region are as sumed to be wake trails shed by low-speed fluid tongues ejected out of viscous sublayer. The assumption is corroborated by experimental evidences. As a result, it was shown that there are 3 kinds of those eddies: streamwise eddies, undulated eddies, and annular eddies. Their properties were described. An application of those concepts to a comparison between the behavior of Newtonion a comparison of the behavior of Newtonian and drag-reducing flows shows the usefulness of the proposed model for a deterministic approach to the forecasting of the structure of turbulent flows. (Singh-ISWS)

W79-00333

Field 8-ENGINEERING WORKS

Group 8B-Hydraulics

MOMENTUM TRANSFER IN A COMPOUND

Ulster Coll. Northern Ireland Polytechnic, Jordan-

Journal of Hydraulic Research, Vol. 16, No. 2, p 139-150, 1978. 10 fig., 2 tab., 9 ref.

Descriptors: *Momentum, *Flood plains, *Natural streams, *Boundary processes, Flumes, Model studies, Hydraulics, Shear stress, Vortices, Channels, *Compound channel, Flood wall, Interacting

A Preston tube was used to measure shear stress distributions around the periphery of a complex channel, consisting of a deep section and one flood plain. Measurements were made with full cross section flow and with flow confined to the deep, or channel, section. The results were used to quantify the momentum transfer due to interaction between the channel flow and that over its flood plain, demonstrating the danger of neglecting this phenomenon in complex channel analysis. Lateral momentum transfer throughout the channel and flood plain was compared under isolated and in-teracting conditions. (Singh-ISWS) W79-00334

HYDRAULIC MODEL INVESTIGATION OF A TWO-WAY DROP INLET FOR FLOODWATER RETARDING STRUCTURE NO. 3, BANKLICK CREEK WATERSHED, BOONE AND KENTON COUNTIES, KENTUCKY,
Department of Agriculture, Minneapolis, MN.

Science and Edi C. L. Anderson nce and Education Administration

Report No. ARS-NC-63, August 1978. 24 p, 17 fig. 6 tab 2 ref.

Descriptors: "Hydraulic models, "Laboratory tests, "Spillways, "Hydraulic structures, 'Kentucky, Reservoirs, Flow control, Model stu-dies, Discharge(Water), Pressure conduits, Measurement, Hydraulics, Data collections, Pressure, Performance, Spillway crests, Methodology, Weirs, Testing, Flow, Flow characteristics, *Banklick Creek(Ky), Drop inlet spillways.

This report described hydraulic model studies of a This report described hydraunc model station two-way drop inlet closed conduit spillway for a floodwater retarding structure. The proposed floodwater retarding structure. The proposed structure was unique. Although the crest of the structure was unique. Although the crest of the drop inlet was 4 pipe diameters (4D) long, and the drop inlet was 2D long, requiring a contraction section between the crest section and the drop inlet shaft. The purposes of the model study were (1) to observe the performance, and (2) to determine the flow and pressure coefficients of the drop inlet. This report described the proposed acceptable structure and it secured the results of prototype structure, and it presented the results of tests on the original design and several modifications of the spillway. The flow into the drop inlet was disturbed by the contraction between the 4Dlong weir crests and the 2D-long drop inlet. The jets from the sloping endwalls in the contraction intersected the nappes falling from the crest. However, these disturbances did not noticeably affect the performance of the structure. The longitudinal splitter wall prevented lateral sloshing of the boil supported on the nappes as the weirs became sub merged. When the longitudinal wall was removed, sloshing of the nappes occurred. (Humphreys-ISWS) 79-00341

STOCHASTIC PROCESSES IN WATER RESOURCES ENGINEERING.

Lund Inst. of Tech. (Sweden). Dept. of Water

Proceedings, Second International IAHR Symposium on Stochastic Hydraulics, Lund Institute of Technology/University of Lund, Sweden, August 1976. Water Resources Publications, Fort Collins, Colorado, 1977. 552 p., 184 fig., 59 tab., 328 ref. Gottschalk, L., Lindh, G., and de Mare, L., Descriptors: "Stochastic processes, Water resources, "Engineering, "Simulation analysis, "Hydraulics, "Risk analysis, "Analytical techniques, Hydrology, Rivers, Reservoirs, Design, Mathematical models, Equations, Systems analysis.

ve and Publication

Stochastic methods have long been applied to problems in certain fields of hydraulics, i.e., turbulence, sediment transport, and wave analysis. The First International Symposium on Stochastic Hydraulics was held in Pittsburg in 1971, showing a trend towards more sophisticated stochastic methods and their application to new areas of hydraulics. This trend becomes even more pronounced at the Second International Symposium held in Lund in 1976. Papers here show a wide spectrum of hydraulic problems approached by stochastic methods and the introduction of new statistical concepts such as Kalman-filtering and entropy. This Proceedings has been published in statistical concepts such as Kalman-filtering and entropy. This Proceedings has been published in two separate books: (1) Stochastic Processes in Water Resources Engineering, and (2) Hydraulic Problems Solved by Stochastic Methods. The former is divided into 3 sections: analysis and simulation of stochastic hydraulic processes; risk analysis and water resources systems. Dealt with analysis and water resources systems. Dealt with are such subjects as sediment storage modeling for are such subjects as sediment storage modeling for reservoirs, the interpretation of surge wave attenuation by the Passage Theory; discounted flood risks in least-cost design of storm sewer networks; uncertainties on roughness for pipe design; stochastic models applied to reservoirs near the Alps; and a stochastic optimization model of the Lech River system. This book contains 25 of the 53 papers presented, representing authors from 17 countries. Detailed analytical techniques are applied throughout to solve a wide variety of problems in stochastic water resources engineering including estimation theory, simulation analying, including estimation theory, simulation analy-sis, dynamic programming, and trade-off analysis. (Bell-Cornell) W79-00380

STORMWATER MODELING, Tennessee Univ., Knoxville. Dept. of Civil Engineering.
For primary bibliographic entry see Field 5B.

HYDRAULICS OF GREAT LAKES INLETS, Coastal Engineering Research Center, Belvoir, VA.

W. N. Seelig, and R. M. Sorensen. W. N. Seeing, and R. M. Sorensen. Available from the National Technical Informa-tion Service, Springfield, VA 22161 as AD-A044 074, Price codes: A04 in paper copy, A01 in microfiche. Technical Paper No. 77-8, July 1977. 69 p, 32 fig, 8 tab, 15 ref.

Descriptors: "Inlets(Waterways), "Seiches, "Bays, "Great Lakes, "Hydraulics, Lakes, Velocity, Hydrographs, Continuity equation, Numerical analysis, "Inlet-harbor resonance, Inlet hydraulics, Reversing velocities.

A simple numerical model was developed to pre-dict inlet velocities, discharge, and bay levels for Great Lakes inlets. The model was applied to several inlets. Examples were given using the model for typical design computations. Numerical modeling of selected inlets showed that head, temmodeling of selected inlets showed that head, tem-poral acceleration of inertia, convective accelera-tion, and friction may all be important in con-trolling the hydraulics of these inlets. Temporal ac-celeration may be specially important as it causes bay fluctuations to be amplified and out of phase with the forcing wave. Even a small-amplitude seiche may generate significant reversing inlet velocities if the wave period is near the inlet-bay Helmholtz period. Reversing velocities at most in-Helmholtz period. Reversing velocities at most in-lets are generally small. However, the velocities may be high if the inlet is located where the lake seiche amplitudes are relatively large and have a period approximately equal to the inlet-bay system Helmholtz period. (Singh-ISWS) W79-00469

VORTEX FORMATION AT VERTICAL PIPE INTAKES.

INTAKES,
Government Coll. of Engineering and Technology,
Raipur (India). Dept. of Civil Engineering.
A. K. Jain, K. G. Ranga Raju, and R. J. Garde.
Journal of the Hydraulics Division, American
Society of Civil Engineers, Vol. 104, No. HY10,
Proceedings Paper 14104, p 1429-1445, October
1978. 11 fig, 14 ref, 2 append.

Descriptors: *Entrainment, *Intakes, *Model studies, Dimensional analysis, Hydraulic models, Pipe flow, Vortices, Submergence, Pipes, Air entrainment, Froude number, Similarities, Circular vortex tanks, Guide vanes.

With the object of determining the similarity criterion, experimental studies on vortex forma-tion at pipe intakes were carried out using two geometrically similar circular vortex tanks; circugeometrically similar circular vortex tanks; circulation in approach flow was generated by means of adjustable guide vanes. Transparent pipe intakes of different sizes and liquids of different viscositites and surface tensions were used in a recirculating system. Based on the analysis of data, a method was proposed, according to which a geometrically similar model is operated at the same Froude number as in the prototype; and the observed critical submergence is corrected for distortion due to change in the model Reynolds number. A criterion to determine the type of vor-tex for known geometric and kinematic conditions also was proposed. (Lee-ISWS)

INTERNAL FRONTS IN TWO-LAYER FLO, Technische Hogeschool, Delft (Netherlands). Dept. of Civil Engineering; and Technische Hogeschool, Delft (Netherlands). Lab. of Fluid

C. Kranenburg.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY10, Technical Note, p 1449-1453, October 1978. 5 fig, 8 ref, 1 append

Descriptors: *Density currents, *Internal waves, *Theoretical analysis, *Flow, Analytical techniques, Mathematical studies, Fluid mechanics, Waves(Water), Equations, Underflow, Hydrodynamics, Shape, Profiles, Two-

The intrusion of a fluid layer into a heavier or lighter fluid has received considerable attention in terature. Two extreme cases regarding the ratio between the depths of the intruding layer and the continuous layer have been examined, i.e., the flow of a relatively thin layer in deep water and exchange flow. Exchange flow arises when a verti-cal barrier separating two fluid layers of approxi-mately equal depths and slightly different densities is removed. A notable progress in the theoretical description of fronts of intruding layers (or density currents) is due to Benjamin who showed that currents) is due to Benjamin who showed that hydrodynamical energy will be conserved only if the depth of the advancing layer equals half the total depth H. If h is less than (1/2)H a loss of energy must occur in the continuous layer. Depths of the advancing layer greater than half the total depth would require a gain of energy, which is physically unrealistic. On the basis of energy considerations, it can be concluded that for real fronts is consideration of the construction of th h is equal to or less than (1/2)H. The technical note showed that a more restrictive condition for the suowen that a more restrictive condition for the existence of fronts than that given by this equation results from an analysis of the stability of a front in relation to internal wave disturbances. (Humphreys-ISWS) W79-00486

CLIMATE CHANGE: DETECTION AND ITS IMPACT ON HYDROLOGIC DESIGN, Washington Univ., Seattle. Dept. of Civil En-

For primary bibliographic entry see Field 2E. W79-00492

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Michigan Univ., Ann Arbor. Dept. of Applied
Mechanics and Engineering Science.
For primary bibliographic entry see Field 3F.
W79-00499

8C. Hydraulic Machinery

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WATER/ENERGY MANAGEMENT AND EVALUATION MODEL FOR PENNSYLVANIA, Pennsylvania State Univ., University Park. Dept. of Industrial and Management Systems Engineer-

For primary bibliographic entry see Field 6D. W79-00007

ENERGY CONVERSION SYSTEM, For primary bibliographic entry see Field 4B. W79-00037

PROCESS AND SYSTEM FOR RECOVERY OF ENERGY FROM GEOTHERMAL BRINES AND OTHER WATER CONTAINING SOURCES BY DIRECT CONTACT WITH A WORKING FLUID BELOW THE CRITICAL PRESSURE, Occidental Petroleum Corp., Los Angeles, CA.

For primary bibliographic entry see Field 4B. W79-00049

DIRECT COOLING WITH GROUND WATER. J. A. May. Water Well Journal, Vol. 13, No. 9, p 57, Sep-

tember, 1978.

*Cooling, Descriptors: *Groundwater, *Cool *Airconditioning, Cooling water, Water wells.

Surface water is usually too warm for cooling but ground water from domestic water wells is an ideal source. Warm air is cooled by the ground water, and the cooled air is returned to the house. The precise water temperature needed for cooling and dehumidification is determined by the coil size, water flow, air flow, and the amount of cooling desired. Economics and space considerations require a temperature of at least 57F. Higher temperature ground water or oversized air conditioners will cool but not dehumidify the air. Corroters will cool but not dehumidify the air. tioners will cool but not dehumidify the air. Corrosion of heat extractor coils results if the coils are aluminum rather than copper, the ground water is too acidic for copper tubing, or the plumbing is used as a ground for electric appliances. Since there is no compressor the operating costs of ground water cooling is much less than standard vapor-compression air conditioning. However, its efficiency depends upon water temperature, well depth, and air volume. Ground water air conditioning units can be used in conjunction with a standard forced air furnace, heat nump, or solar enerdard forced air furnace, heat pump, or solar energy systems. (Purdin-NWWA) W79-00173

HEAT PUMP ACCESSORIES CAN SAVE YOU MONEY, National Water Well Association, Worthington,

J. L. Persons.

Water Well Journal, Vol. 13, No. 9, p 47, September, 1978.

Descriptors: *Heating, *Heat pumps, *Economics, Groundwater, Accessories, Energy efficiency, Costs.

The average residential ground water heat pump costs between \$1500 and \$3000. This initial investment is repayed through energy savings. Several accessories are described which can increase the energy and cost efficiency of the heat pump. These accessories include: (1) an intermediate

storage tank; (2) solar collectors; air conditioners; and water heaters. When a single cycle ground water heat pump is used, both refrigerant and vapor compression cycle tubing can be designed for optimum performance in either a heating or cooling cycle. (Purdin-NWWA) W79-00174

HOUSING PROJECT TO UTILIZE GROUND WATER. Water Well Journal, Vol. 32, No. 10, p 58-59. 1 fig

Descriptors: "Heat pumps, "Solar energy, "Heating, "Cooling, Water utilization, Energy conservation, Groundwater.

A residential development near Dayton, Ohio will be heated and cooled by a solar energy/water source heat pump system. During the heating cycle radiant energy from the sun is transferred to water stored in an underground tank. During the summer, heat is extracted from interior spaces and dissipated to the ground water by using an un-derground closed loop as a heat exchanger. Initial cost for the system include: a solar water heater; a special grate to absorb fireplace heat; a micro-processor which automatically selects the most economical form of heating and cooling; a clothes dryer; and a kitchen range. Electric power for the units will be supplied by a bioconversion plant, where methane gas from human waste will be used to run a turbine generator. This system is predicted to work in 90 percent of the United States. (Purdin-NWWA) W79-00178

WELL POINT SYSTEMS. Drilling News, Vol. 3, No. 2, p 12, Winter, 1978. 1

Descriptors: *Well points, *Pumps, Aquifers, Drawdown, Shallow wells, Water wells.

A well-point system is a series of shallow boreholes connected to a central pump to obtain large quantities of water economically. Three conditions are necessary for a well-point system: (1) the water table must be within a few meters of the land surface; (2) a good aquifer must be found at depths of 6-15 m; and (3) the wells themselves must be highly efficient. Locating the wells on the circumference of a circle gives the system greatest hydraulic efficiency. The maximum drawdown at which the wells can be operated is the difference between the suction head of the pump and the static water level. A pump that has good suction characteristics should be selected. All piping con-nections on the suction side of the pump must be absolutely air tight and the well screen must be set before the suction limit of the pump. Where this is not possible due to a thin aquifer, the pumping rate must be reduced. An alternative to this is the use of a drop tube inside the well screen which will permit the pumping level to drop below the top of the screen. (Purdin-NWWA)

EFFICIENCY OF SCREENLESS WELLS FOR IRRIGATION. Ministry of Reclamation and Water Management,

Moscow (USSR).
For primary bibliographic entry see Field 3F. W79-00184

WATER AND LAND RESOURCE ACCOM-PLISHMENTS 1975, STATISTICAL APPENDIX II-FINANCES AND PHYSICAL FEATURES. Bureau of Reclamation, Washington, DC. Bureau of Reclamation, Washingto Economics and Program Analysis Branch. For primary bibliographic entry see Field 3F. W79-00193

WET COOLING TOWER BACKFITTING ECONOMICS, Iowa Univ., Iowa City. Div. of Energy Engineering; and Iowa Univ., Iowa City. Div. of Research Engineering. For primary bibliographic entry see Field 5G. W79-00233

8D. Soil Mechanics

STABILIZATION OF EARTH SUBSURFACE

KAYERS, Woodbine Corp., Fort Worth, TX. (Assignee).
G. Cain, J. D. Teague, and P. J. Wright.
U.S. Patent No. 4,084,381, 8 p. 2 fig, 1 tab, 8 ref;
Official Gazette of the United States Patent Office, Vol 969, No. 3, p 835, April 18, 1978.

Descriptors: *Patents, *Soil stability, *Subsurface flow, Soil water movement, Soil strength, Ground-water movement, Stabilization, Fly ash, Lime.

method of treating subsurface layers of the earth is provided to perform one of controlling movement of subsurface water and building strength of the subsurface layers. It is characstrength of the subsurface layers. It is charac-terized by injecting at predetermined depth and at predetermined, spaced-apart locations a lime-fly ash slurry consisting essentially of water, particu-late hydrated lime, particulate fly ash and surfac-tant. In the preferred embodiment, the particulate in a proportion within a range of 25-60% by weight of the water. The particulate solids comprise lime in a proportion of 25-50% by weight and fly say in a the water. The particulate solids comprise time in a proportion of 25-50% by weight and fly ash in a proportion of 75-50% by weight. The invention relates to improving the subgrade for buildings, road beds, or the like. (OEIS-Sinha) W79-00035

DEFLECTION OF P.V.C. PIPE UNDER BURIAL

CONDITIONS, Ontario Ministry of the Environment, Toronto.

M. B. Fielding. Report No. R. P. S2045, May 1978. 16 p, 10 tab, 6

Descriptors: *Soil physical properties, *Piping systems, *Polyvinyl chloride, *Soil mechanics, Soil modulus, Passive resistivity, Spangler formu-

In designing flexible piping systems used for underground, nonpressurized flow, the resistance of the pipe to deflection is a function of both the stiffthe pipe to deflection is a function of both the stiff-ness of the pipe material and the lateral support provided by the surrounding soil. One type of plastic used for such piping is made of polyvinyl chloride (PVC). The design formula for flexible pipelines, first stated in 1941 by Spangler, took this concept into account and has become an ac-cepted method of flexible conduit design. Howcepted method of flexible conduit design. How-ever, difficulties in obtaining values for some parameters, such as soil modulus of passive re-sistivity, has led to attempts to develop alterna-tives to the Spangler formula. Nevertheless, the modified Spangler approach remains theoretically sound and, with appropriate modifications, can achieve excellent results. One additional refinement is described: to incorporate measurable values of pipe stiffness isn place of 'EI' in the formula delta x = D.K.Wc. cu r/EI + 0.016E' cu r. mula delta x = D.K.Wc. cu r/EI + 0.016E' cu r.

THe soil modulus is essentially an unmeasurable quantity and is usually determined experimentally by measuring pipe deflection under a known load and calculating the value of E' which would limit deflection to the measured value. In this paper, the values used for E' were collected from several reference sources and are tabulated for several reference sources and are tabulated for several reference sources and are tabulated. representative soil types. Sample computations are included and the resuls for maximum long term deflection of nine types of PVC pipe are tabulated for class I and II gravel, sand, clay, and peat. (Majtenyi-IPA) W79-00103

Field 8—ENGINEERING WORKS

Group 8D—Soil Mechanics

USING ICE AS WATER-IMPERMEABLE ELE-MENT IN ROCKFILL DAMS, N. A. Tsytovich, V. A. Vesilov, and N. V.

N.A. 18ytoven, v. A. Vesidov, and R. V. Vesidov, and R. Vesidov, and R. V. Vesidov, and R. Vesidov, and R. V. Vesidov, and R. November 1977. 8 p, 2 fig, 3 ref. Translated from Trudy Koordinatsionnykh Soveschanii Po Gidrotekhnike, Vol. 10, p 132-136, 1964.

Descriptors: *Rockfill dams, *Cold weather construction, *Model studies, Mathematical models, Ice, Freezing, Thawing, Permeability. Cold regions, Earth dams, Dams, Structures, Hydraulic structures, Temperature, Heat transfer, Ice cores.

At the present time, rockfill dams are used extensively in the Soviet Union and abroad. It is known that the antifiltration elements in them are cores or that the antifiltration elements in them are cores or screens made of water-impermeable materials. After analyzing planning materials and experience in construction of structures under harsh climatic conditions, constructing rockfill dams with ice cores in areas where permafrost soil occurs was suggested in 1961. The natural conditions in the proposed construction regions are characterized by harsh and prolonged winters, with a considerable thickness of permafrost, which is a positive factor for construction and operation of these dams. The principal difficulty in building such a dams. The principal difficulty in building such a dam under conditions where permafrost soils occur involves the changes in the temperature regime of the body of the dam and its foundation over the course of time. A method was developed to calculate the nonstationary temperature field of a frozen rockfill dam and a foundation under any given boundary conditions, determined by the natural data of the region. As a result of the stu-dies, it was found that the version of the rockfill dam with an ice core can have sufficient thermal and statistical stability. These studies are continuing, but the results already obtained indicate that such a dam is competitive with other structural varieties. (Sims-ISWS) W79-00466

ALLOWING FOR THE WATER PERMEABILI TY OF FROZEN GROUND SCREENS DURING

A. I. Pekhovich. Available from the National Technical Informa-Available from the National Technical informa-tion Service, Springfield, VA 22161 as AD-A041 899, Price codes: A02 in paper copy, A01 in microfiche. CRREL Draft Translation 591, February 1977. 8 p, 4 fig, 5 ref. Translated from Iz-vestiya Vsesoyuznogo Nancho-Issledovatel'skogo Instituta Gidrotekhniki imeni B.Ye. Vedeneyev, Vol. 54, p 208-213, 1955.

Descriptors: *Cofferdams, *Frozen ground, *Permeability, Cold regions, Cold weather construction, Dams, Freezing, Infiltration, Model stu-dies, Mathematical models, Structures, Hydraulic structures, Soil water, Soil water movement, Soil science, Earth dams.

Creation of water-impermeable cofferdams is an important and sometimes extremely complex problem which builders, in particular those who problem which builders, in particular those who construct hydraulic facilities, are frequently called upon to solve. One of the most widely used methods of constructing water-impermeable dams is the method of artificially freezing ground. Artificially freezing ground, consists of the following:

Freezing columns are implanted in the dam with a certain distance between them. Brine is circulated in the columns and is cooled by a refrigeration device. Initially, individual frozen ground cylinders are formed around each column, and these cylinders then join into a single water-impermeacylinders then join into a single water-imperimen-ble mass. It is obvious that between the beginning of freezing and the complete interconnection of the frozen ground cylinders, the rate of the filtra-tion flow through the cofferdam changes. The question of how large the filtration flow is during

this period is not only of theoretical but also of considerable practical interest—for instance in determining the value of the heat flow from the nonfrozen ground to the frozen ground cylinders (in calculating the freezing speed), in determining the possible value of the filtration flow rate through the cofferdam when the frozen ground cylinders do not join completely (the problems of desinger from the execution). drainage from the excavation), etc. Unfortunately, no appropriate calculation method has yet been devised. This article was designed to fill this gap. (Sims-ISWS) W79-00467

FREE-SURFACE SEEPAGE PROBLEM, California Univ., Santa Barbara. Dept. of Mathe-

J. M. Sloss, and J. C. Bruch, Jr. J. M. Sioss, and J. C. Bruch, 1r. Journal of the Engineering Mechanics Division, American Socity of Civil Engineers, Vol. 104, No. EM3, Proceedings Paper 14058, p 1099-1111, October 1978. 3 fig, 3 tab, 17 ref, 2 append.

Descriptors: *Dams, *Seepage, *Model studies, *Mathematical models, Earth dams, Equations, Mathematics, Flow, Groundwater movement, Drainage, Computer models. Analytical techniques, Civil engineering, Variance analysis, Dam underscepage, Inequalities.

The flow problem of seepage through a homogeneous dam on an impervious foundation with a toe drain was solved numerically using the Baiocchi method. The numerical scheme reduces to an algorithm that is computationally efficient, accurate, and fast, and requires only a fraction of the preprocessing effort time that the other numerical algorithms do. The results compared well with other numerical and analytical results. The problem also was reduced to a variational inequality that was shown to have at most one solution from which it follows that the original problem has at most one solution. (Sims-ISWS) W79-00496

8E. Rock Mechanics and Geology

SUMMARIES OF PHYSICAL RESEARCH IN THE GEOSCIENCES.

Department of Energy, Washington, DC. Div. of Basic Energy Sciences.
For primary bibliographic entry see Field 10F.
W79-00101

TUNNEL COMPONENT OF THE TUNNEL AND RESERVOIR PLAN PROPOSED BY THE METROPOLITAN SANITARY DISTRICT OF GREATER CHICAGO, LOWER DES PLAINES

TUNNEL SYSTEM.

Booz-Allen Applied Research, Bethesda, MD.
For primary bibliographic entry see Field 5D. W79-00465

8G. Materials

LOW MOLECULAR WEIGHT HYDROLYZED POLYACRYLAMIDE USED AS A SCALE IN-HIBITOR IN WATER SYSTEMS, American Cyanamid Co., Stamford, CT. (Assignee). For primary bibliographic entry see Field 5F. W79-00027

TREATMENT OF WATER OR AQUEOUS SYSTEMS, Ciba-Geigy Corp., Ardsley, NY. (Assignee). For primary bibliographic entry see Field 5F. W79-00039

EMPLOYING METHYLENE PHOSPHONATES
OF OXYALKYLATED POLYALKYLENE
POLYAMINES IN CHELATION AND/OR
SCALE INHIBITION,
Petrolite Corp., St. Louis, MO. (Assignee).
For primary bibliographic entry see Field SF.
W79-00052

LOW TOXIC CORROSION INHIBITORS FOR ALUMINUM IN FRESH WATER, National Aeronautics and Space Administration, Huntsville, AL. George C. Marshall Space Flight

Center.

7. S. Humphries.

Available from the National Technical Information Service, Springfield, VA 22161 as N7828226, Price codes: A02 in paper copy, A11 in microfiche. Report No. NASA TP-1279, July 1978. 16 p, 3 tab.

Descriptors: *Corrosion control, *Aluminum, *Chemical reaction, Sodium chromate, Borates, Nitrates, Phosphates, Silicates, Sodium mercaptobenzothiazole, Hydrogen ion concentration, Water injury, Inhibitors, Inorganic compounds, Nitrites, Sodium compounds.

The effectiveness of using combinations of chemicals to inhibit the corrosive action of water on aluminum was evaluated. Since use of chromate inhibitors was restricted, there is a need for new, low toxicity inhibitors. Combinations of several inorganic chemicals, such as borates, nitrates, nitrites, phosphates, and silicates, as well as sodium mercaptobenzothiazole were evaluated at various concentrations and conditions, including temperature and pH. Combinations were used because, individually, these compounds are only partially effective as inhibitors of corrosion. Of 50 mixtures tested, 8 showed excellent corrosion inhibition on 2219-T87 aluminum compared to a sodium chromate standard. (Majtenyi-IPA) The effectiveness of using combinations of chemi

DEFLECTION OF P.V.C. PIPE UNDER BURIAL

Ontario Ministry of the Environment, Toronto. For primary bibliographic entry see Field 8D. W79-00103

WATER ANALYTICAL DATA AS A TOOL IN DRILLING AND PRODUCTION ECONOMICS, W. C. Martin.

Journal of Petroleum Technology, Vol. 30, No. 9, p 1342-1346, September, 1978. 4 tab.

Descriptors: "Water analysis, "Water chemistry,
"Oil reservoirs, "Drilling, "Water sources, Water pollution, Injection, Compatibility, Corrosion, Scaling, Water sampling.

A detailed summary is provided of the application of water analytical data in drilling and producing oil and gas. Basic requirements for sampling and analysis of water are tabulated. It is important to examine each constituent and its relationship to other constituents in determining the origin of any water. Various sources of water are: casing leaks, injection breakthrough; connate water; acid treatinjection breakthrough; connate water; acid treatment water; drilling brine; produced water; irrigation water; sewage effluent; and other waste water. The compatibility of two or more water must be determined before they are combined. Several common incompatible combinations are listed. The potential corrosiveness of any water must be evaluated. Hydrogen sulfide, carbon dioxide, oxygen, pH, temperature and undersaturation are the principle parameters. The presence of aerobic bacteria and coloration of the water indicates air, contamination which may accessive. dicates air contamination which may aggravate corrosion. It is possible to predict whether a water corrosion. It is possible to predict whether a water will deposit scale. Four common scaling components: calcium carbonate, calcium sulfate, barium sulfate, and strontium sulfate are discussed. Water analytical data such as filterable solids, abrasives, suspended oil, and bacteria are useful in injection water studies. (Purdin-NWWA)

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DIRECT COOLING WITH GROUND WATER, For primary bibliographic entry see Field 8C. W79-00173

HEAT PUMP ACCESSORIES CAN SAVE YOU MONEY, National Water Well Association, Worthington,

For primary bibliographic entry see Field 8C. W79-00174

GROUNDWATER PUMPING TECHNIQUES FOR EXCAVATIONS AND OTHER WORKS, P. M. Cashman. Drilling News, Vol. 3, No. 2, p 7-11, Winter, 1978.

Descriptors: *Dewatering, *Excavation, *Settlement(Stretural), Well-points, Bored-filter wells, Freezing, Electro-osmosis, Aquifers, Sumps, Soil mechanics, Artificial recharge.

Ground-water control during excavation can be achieved by pumping or forming an impermeable barrier. What technique should be used depends on the type and strata of soil, foundation specification, and groundwater encountered. The most commonly used methods of groundwater lowering are conventional sump pumping, well-pointing, and bored filter wells. Lowering of the phreatic surface increases the effective load on the soil and surface increases the effective load on the soil and can cause settlement, especially in a confined aquifer. In some cases it may be necessary to employ ground water recharge to reduce potential settlement. Freezing and electro-osmosis form an impermeable barrier under appropriate conditions. Freezing can be used in all types of saturated soils or rocks. Liquid nitrogen provides a faster rate of cooling than brine. Electro-osmosis can be used in all types of saturated soils or rocks. silts or very soft cohesive soils to reduce moisture content and increase shear strength. (Purdin-NWWA) W79-00185

FUNCTIONS AND PROPERTIES OF DRILLING

Drilling News, Vol. 3, No. 3, p 6-12, Spring 1978.

Descriptors: *Drilling fluids, *Colloids, *Wells, Drilling, Rotary drilling, Technology(Wells), His-

The history of the development of drilling mud technology is summarized. Various functions of echnology is summarized. Various functions of drilling mud are discussed, such as: cooling the bit; removing cuttings from the hole; preventing caving; controlling of gas, oil, or water pressure in the formation penetrated; lubricating drill pipe, wall of the hole, casing, slush pumps and bit bearings; checking corrosion; holding all solids in suspension in the portion of the drilling mud in the hole, particularly during interruptions in drilling; depositing all sand and cuttings in the ditch or setting pit; and facilitating the movement of drill pipe and casing. The ability of a drilling mud to fulfill all the above functions, except those involving unit weight, is largely due to the concentration of colloidal material in the mud. Other characteristics of drilling fluids that aid in performance of functions drilling fluids that aid in performance of functions are: freedom from grit or abrasive particles; high density or unit weight; correct pH; and low con-centrations of salt and other electrolytes. A drilling mud must not deposit a thick filter cake on the mud must not deposit a thick filter case of walls of the hole nor allow a high volume of filtrate to invade the formation. (Purdin-NWWA) W79-00186

DEVELOPMENT OF LOW COST MEMBRANE CLEANING AGENTS, Grace (W. R.) and Co., Columbia, M.D. For primary bibliographic entry see Field 3A. W79-00304

81. Fisheries Engineering

STAMINA TUNNEL TESTS ON HATCHERY-REARED ATLANTIC SALMON, Maine Cooperative Fishery Research Unit, Orono. J. D. McNeish, and R. W. Hatch. The Progressive Fish Culturist, 1978, Vol. 40(3), July 1978, p 116-117. 1 tab, 5 ref.

Descriptors: *Atlantic salmon, *Methodology, Laboratory tests, Laboratory equipment, *Fish physiology, *Fish diets, Aquaculture, Fish hatcher ries, Maine, Juvenile fish, *Hatchery-reared At-lantic salmon, *Fish stamina, Stamina tunnel tests.

Authors describe a stamina tunnel for evaluating the stamina of hatchery-reared Atlantic salmon and to evaluate the effects on stamina of different diets and different fish establishments. They con-clude that variables other than those to be tested were present and the apparatus could not be used. (EIS-Katz) W79-00075

REARING OF CHINOOK SALMON IN TRIBU-TARIES OF THE SOUTH FORK SALMON RIVER, IDAHO,

Intermountain Forest and Range Experiment Station, Ogden, UT.

W. S. Platts, and F. E. Partridge.

Department of Agriculture, Forest Service,
Research Paper INT-205, 15 p, May, 1978. 3 fig, 12

Descriptors: *Chinook salmon, *Habitats, *Idaho, Fisheries, Stream fisheries, Fish management, Tributaries, Salmon, Aquatic habitats, Cutthroat trout, Aquatic animals, Aquatic life, Fish, Salmon River(Idaho), Trout.

Fish populations in 23 tributaries of the South Fork Salmon River (Idaho) were samples in 1971, 1972, and 1974. Juvenile chinook salmon were 1972, and 1974. Juvenile chinook saimon were found in one secondary and 11 primary tributaries. The first 400 m reach of stream adjacent to the river was the most important area for rearing and supported 58% of the total tributary chinook sal-mon population. Only three tributaries had chin-ook salmon more than 1.6 km from the river. The ook salmon more than 1.6 km from the river. The tributary chinook salmon standing crop ranged from 0.01 to 0.38/sq m and averaged 0.06/sq m for all streams. Cutthroat trout and chinook salmon were not found together. Chinook salmon preferred the larger lower gradient, grassy-banked streams having deep pools. (Witt-IPC) al trophic balance. (Sinha-OEIS) W79-00428

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication **And Distribution**

ATMOSPHERIC WATER-VAPOR RESOURCES FOR RAINFALL AS THEY ARE RELATED TO WATER SYNTHESIS IN PLANT LIFE, AN-NOTATED BIBLIOGRAPHY. Manuscript, Los Angeles, CA, August 1978, 46 p, Compiled by Michael Aron Weinberg.

Descriptors: *Bibliographies, *Rainfall, *Water vapor, *Atmosphere, *Plant physiology, Water balance, Water resources.

This bibliography contains 359 annotated entries, listed in chronological order, pertaining to at-mospheric water vapor resources for rainfall and their relationship with water synthesis in plant life. Scientific and other periodicals, books, and plays are included, and each entry is coded as to subject, such as climate, chemistry, fiction, plants and

plant physiology, and weather and meteorology. In addition, there is a list of authors by year giving keyword subjects, and an alphabetical list of authors. (Majtenyi-IPA) W79-00106

FRAZIL ICE FORMATION: A REVIEW, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W79-00120

LITERATURE REVIEW FOR EXPLORE-I: A RIVER BASIN WATER QUALITY MODEL. AP-PENDIX A, Battelle Pacific Northwest Labs., Richland, WA. For primary bibliographic entry see Field 5B. W79-00188

ASBESTOS - A BIBLIOGRAPHY, Environmental Research Lab.-Duluth, MN. For primary bibliographic entry see Field 5A. W79-00225

SUMMARY OF U.S. GEOLOGICAL SURVEY INVESTIGATIONS AND HYDROLOGIC CON-DITIONS IN THE SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT FOR 1977, Geological Survey, Tallahassee, FL. Water Resources Div. For primary bibliographic entry see Field 4A. W79-00272

PRELIMINARY STUDY OF SELECTED POTENTIAL ENVIRONMENTAL CONTAMINANTS -OPTICAL BRIGHTENERS, METHYL
CHLOROFORM, TRI-CHLOROETHYLENE,
TETRACHLOROETHYLENE AND ION
EVEN AND EDSTROET EXCHANGE RESINS, Franklin Inst. Research Labs., Philadelphia, PA.

Science Information Services Dept.
For primary bibliographic entry see Field 5A.

BIOLOGICAL EFFECTS AND ENVIRONMEN-TAL ASPECTS OF 1,3-BUTADIENE, Radian Corp., Austin, TX. For primary bibliographic entry see Field 5C. W79-00292

PCB IN WATER, A BIBLIOGRAPHY, VOLUME Office of Water Research and Technology,

Washington, DC.
For primary bibliographic entry see Field 5A. W79-00305

OZONE IN WATER AND WASTE WATER TREATMENT, A BIBLIOGRAPHY, VOLUME 2. Office of Water Research and Technology, Washington, DC.
For primary bibliographic entry see Field 5D. W79-00306

RAPHY, VOLUME 3,
Department of the Interior, Washington, D. C.,
Office of Water Research and Technology.
For primary bibliographic entry see Field 3F.
W79-00307 IRRIGATION EFFICIENCY, A BIBLIOG-

AGRICULTURAL AND HYDROLOGICAL AP-PLICATIONS OF RADAR: FINAL REPORT, Kansas Univ. Space Technology Center, Lawrence. Remote Sensing Lab. For primary bibliographic entry see Field 7B. W79-00464

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION Group 10F—Preparation Of Reviews

10F. Preparation Of Reviews

SUMMARIES OF PHYSICAL RESEARCH IN THE GEOSCIENCES. Department of Energy, Washington, DC. Div. of Basic Energy Sciences. Report No. DOE/ER-0016, September 1978. 52 p.

Descriptors: *Geophysics, *Geothermal studies, *Remote sensing, Projects, *Department of Energy research, Aeronomy, Seismology, Geology, Hydrology, Geochemistry, Petrology, Energy, Meteorology, Sediments, Brines, Kinetics, Aqueous solutions.

Research supported by the Department of Energy is aimed at providing basic knowledge in the fields of earth, atmospheric, and solar/terrestrial sciences. This series of summaries prepared by the investigators describes work performed during 1977, the scope of work to be done in 1978, and some information on research planned for 1979. Included under the heading of on-site geosciences are programs on geoscience; remote sensing, aeronomy, geothermal energy, thermodynamics of silicates, seismology, magma energy research, and physical chemistry of geothermal solutions. Under the heading off-site geoscience, are such areas of research as seismology, meteorology, magnetic field annihilation process in the magnetosphere, isotopic studies of rare gases in terrestrial samples, and organic geochemistry of outer continental margin and deep ocean sediments. Among the programs related to water research are projects on geothermal energy, thermodynamics of high temperature brines, and kinetics and transport of aqueous solutions. (Majtenyi-IPA)

FRAZIL ICE FORMATION: A REVIEW, Alaska Univ., College. Geophysical Inst. For primary bibliographic entry see Field 2C. W79-00120

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SUBJECT INDEX

	The state of the s	and the state of t
ABSORPTION	ACIDIC SOILS	Oxygen Activated Sludge Considerations for
Uptake and FAte of DI-2-Ethylhexyl Phthalate	Investigations of the Molecular Weight, Free	Industrial Applications,
in Aquatic Organisms and in a Model	Radical and Metal Interactions of Isolated	W79-00354
Ecosystem,	Aquatic and Soil Fulvic Acid,	
W79-00061	W79-00436	ADMINISTRATION
Uptake of Americum-241 by Algae and Bac-	ACIDIC WATER	Water Administration in England and Wales Impacts of Reorganization,
teria,	Chemistry of Small Norwegian Lakes, with	W79-00384
W79-00067 5B	Special Reference to Acid Precipitation,	Entire National State of the second
	W79-00321 5A	ADSORPTION
Solute Transport During Absorption of Water		Adsorption of Some Toxic Substances by
by Soil: Laboratory Studies and their Practical	Investigations of the Molecular Weight, Free Radical and Metal Interactions of Isolated	Waste Components,
Implications, A Manager Bank and an and an and an and an and an	Aquatic and Soil Fulvic Acid,	W79-00152 5B
W79-00472 2G	W79-00436	Process for Purifying Aqueous Industrial Ef-
ARSTRACTS TO MINIO TOTAL W. A.S. MELLISCO M.	0 (EL 1972) A 20 (5)(0 (4) on/on.et/0	fluents.
Summary of U.S. Geological Survey Investiga-	Genetic and Environmental Factors Involved in	W79-00399 5D
tions and Hydrologic Conditions in the	Increased Resistance of Brook Trout to Sul- furic Acid Solutions and Mine Acid Polluted	
Southwest Florida Water Management District	Water	AERATION
for 1977,	W79-00458 5C	Activated Sludge System with Staggered Parti- tion Basin,
W79-00272 4A	656-477	W79-00055 5D
LOGBON CHILD'S Propositive Walloly Mann	ACTIVATED CARBON	Devides much Man Labore and in Rose
ACCESS Distributional Implications of the Enteredad	Carbon Contact Column,	AERIAL PHOTOGRAPHY
Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-	W79-00028	Remote Monitoring of Coal Strip Mine Reha-
sues in the Fishery,	What's in the Water, A Look at the Proposed	bilitation,
W79-00236 Addanted to vector 6E	EPA Regulations for Organic Chemicals in	W79-00226
(Dyslandelbae, Edwilvis) us Calife Recolving	Public Water Supplies,	AEROBIC TREATMENT
Distributional Implications of Extended Fishe-	W79-00179 5F	Distribution of Heterotrophic and Nitrifying
ries Jurisdiction: Some Research and Policy Is-		Bacteria Within the Aerobic-Media Trickling
sues: Discussion,	On the Removal of Lignosulfonates and Car-	Filter.
W79-00237 6E	bohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von	W79-00433 5D
Plantal to the state of the sta	Ligninsulfonaten und Kohlenhydraten aus Sul-	
Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-	fitzellstoff-Waschwaessern mittels Aktivkohle),	Aerobic Media Trickling Filter Applied to
sues in the Fishery: Discussion,	W79-00410 5D	Nitrogen Control,
W79-00238 6E	Annual State of the Control of the C	W79-00445 5D
ANGELS ANGELS	ACTIVATED SLUDGE	A Study for Improving the Aerobic-Media
ACCIDENTS	Treatment of Solids-Liquid-Gas Mixtures, W79-00022 5D	Trickling Filter.
Safety Aspects of Toxic and Hazardous Spills,	W79-00022 5D	W79-00457 SD
W79-00345 5G	Activated Sludge System with Staggered Parti-	The Miles of Linesh Wester on Alese Lapula-
ETHOD SAIDER	tion Basin,	AFRICA
Management Plan for Control and Treatment of	W79-00055 5D	A Storm Rainfal Pattern Above the Central
Toxic Substances,	The Pitters of Contribution Projections on	African Plateau,
W79-00346 5G	The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Ac-	W79-00126 2B
ACCLIMATION	tivated Sludge Microflora,	AGENCY-GOVERNMENT INTERFACE
Adaptations and Resistance to Anoxia in	W79-00159 5D	A Study of Coastal Pollution and Agency Inter-
Cloeon Dipterum (Ephemeroptera) and Nemou-	our president and a soul quantities	face,
ra Cinerea (Plecoptera),	Controlling and Monitoring Activated-Sludge	W79-00389 5G
W79-00076 5G	Units,	ENGINEER TO BE AND THE PROPERTY OF THE PARTY
ACETIC ACID	W79-00160 5D	AGGREGATES Seepage Control by Particle Size Selection,
meetic neib	Water 1977.	W79-00484
Solvent Extraction for Treatment of Waste-	W79-00342 5D	W79-00484 4A
waters from Acetic-Acid Manufacture, W79-00366 5D	MOMORIA MOMORIA	AGRICULTURAL ECONOMICS
W 19-00300	The UNOX Process: Effective Wastewater	Natural Resource Economics: The Upsetting
ACID MINE WATER	Treatment Practice, W79-00347 5D	Discipline,
Studies of Ion Exchange and Chelation Com-	#19-00341	W79-00242 6B
pounds Adsorbed on Granular Graphite,	Comparison of Complete Mixed Activated	AIR ENTRAINMENT
W79-00431 5D	Sludge and UNOX Treatment of Brewery	Air Entrainment in Radial Flow Towards In-
The Committee of the land of t	Wastes, Al Harris and Smith Die Recompti	takes,
Continuous Electrochemical Synthesis Using a	W79-00348 5D	W79-00315 8B
Packed Granular Electrode,	UNOX Wastewater Treatment System Per-	
W79-00432 5D	formance Silicone Chemical Complex,	AIR POLLUTION
Recovery of Sanitary-Indicator Bacteria from	W79-00349 5D	Acid Precipitation in the Netherlands,
Streams Containing Acid Mine Water,	COST OF THE AMERICAN SPECIAL SECTION OF THE PARTY.	W79-00138 5A
W79-00444 5A	Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud	Asbestos - A Bibliography,
	Possible design	W79-00225 5A
Genetic and Environmental Factors Involved in	Precipitation, W79-00350 5D	
Increased Resistance of Brook Trout to Sul-		Analysis of Radioactive Contaminants in By-
furic Acid Solutions and Mine Acid Polluted Waters.	Effects of Dissolven Oxygen in the Oxygena.	Products from Coal-Fired Power Plant Opera-
Waters, W79-00458 5C	tion Activated Sludge Process,	tions, W79-00227
	W79-00351 5D	W79-00227
ACID STREAMS	Dynamics and Control of Suspended Solids in a	Wastewater Odor Problem Solving Process
Hydrolysis of Iron from Acidic Liquors,	Two-Step Activated Sludge Plant,	Modification Versus Air Treatment,
W79-00228 5D	W79-00352 5D	W79-00373 5E

Use of Bacteria Cultures,	A Digital Model of Part of the Rio Tempisque	Wet Cooling Tower Backfitting Economics, W79-00233
W79-00374 5D	Alluvial Aquifer, Costa Rica,	Modeling for Organizational Decision-Making:
AIR POLLUTION EFFECTS	W79-00311	Profits vs. Social Values in Resource Manage-
Asbestos - A Bibliography,	ALLUVIAL CHANNELS	ment,
W79-00225 5A	Three-Dimensional Open Channel Flow, W79-00312	W79-00243 6A
AIR-WATER INTERFACES		Automated Determination of Selenium in
Transfer of Gases at Natural Air-Water Inter-	ALTERNATIVE PLANNING Modeling for Organizational Decision-Making:	Water, W79-00261
faces, W79-00127	Profits vs. Social Values in Resource Manage-	
d mineral of the state of the s	ment, W79-00243	Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their
Seven Problems in Bubble and Jet Drop Researchers,	housened to understand many and made and	Determination and Biological Availability,
W79-00319 8B	Lake Level Control and ManagementA Case Study,	W79-00271
AIRCONDITIONING	W79-00390	Modelling the Water Quality of the Hydrologi-
Direct Cooling with Ground Water,	ALUM-MUD PRECIPITATION	cal Cycle. W79-00379
W79-00173 8C	Designing and Operating an Oxygen Activated	Constituted Dr. of the William St. of the World
ALAR-85	Sludge System Including Tertiary Alum-Mud	Stochastic Processes in Water Resources En- gineering.
Chemical Inhibitors of Plant Transpiration: IV.	Precipitation, W79-00350 5D	W79-00380 8B
Action of Alar-85, (In French), W79-00247	SCHOOL MALE AND	Stormwater Modeling,
and the second section of the section o	ALUMINUM Low Toxic Corrosion Inhibitors for Aluminum	W79-00381 a management to the state 5B
ALBEDO Determination of Terrestrial Albedo from	in Fresh Water,	ANIMAL POPULATIONS
LANDSAT I Satellite Imagery in Photographic	W79-00091	Ecology of Dreissena Polymorpha (Pall.)
Form,	AMERICA FALLS RESERVOIR (IDA)	(Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,
W79-00012 7B	The Source of American Falls Reservoir Pollu- tants,	W79-00068
ALBERTA (CANADA)	W79-00004 5B	ANIONS
Hydrogeology of the Grande Prairie Area, Al- berta,	AMERICIUM OF SOURCE DATEVIES A MIN	Leaching Characteristics of Various Heavy
W79-00470 2F	Transuranic Nuclides in Plaice (Pleuronectes	Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,
ALDRIN	Platessa) from the North-Eastern Irish Sea, W79-00077	W79-00459 5B
Criteria Documents for Aldrin/Dieldrin.	a Salar Life proper distance.	ANNUAL
W79-00282 5A	AMERICUM Uptake of Americum-241 by Algae and Bac-	An Estimate of Annual Runoff from England
ALGAE	teria,	and Wales, 1728-1976, W79-00124 2E
The Effects of Heavy Metals on Algae Popula-	W79-00067	DE TARGO OTWIE
tions in a South Central Reservoir, W79-00011 5C	AMMONIA	ANNUAL COSTS Water and Land Resource Accomplishments
	Removal of Complex Copper-Ammonia Ions	1975, Statistical Appendix II-Finances and
The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove	from Aqueous Wastes with Fly Ash, W79-00155 5D	Physical Features.
and Salt Marsh Estuary: A Comparative Study,		W79-00193 3F
W79-00204 5C	Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the	ANTARCTICA
		Inland Ice Chest Thinning Due to Holocene
An Investigation of Primary Production and	Preparation of Complex Fertilizers (Primenenie	Inland Ice Sheet Thinning Due to Holocene Warmth,
Ecosystem Metabolism in a Lake Michigan	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh	
Ecosystem Metabolism in a Lake Michigan Dune Pond,	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),	Warmth,
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya	Warmth, W79-00340 2C AQUACULTURE Simple Venturi Device for Mixing Freshwater
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumula-	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a	Warmth, W79-00340 2C AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 7B
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumula- tion of Beet-Sugar Factory Wastes, W79-00216 5C	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Con-
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologi- cally Treated Effluent in Laboratory and Con- structed Streams,
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Waste-	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 5C
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 Aquatic Inhabitants of a Mine Waste Stream in Arizona.
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts., Poland) Polluted with Domestic Sewage,	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 5C
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 5C Aquatic Inhabitants of a Mine Waste Stream in Arizona,
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves,	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Ac-	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 SC AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amurinto Water Bodies (In Bussian)
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 SC AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amurinto Water Bodies (In Bussian)
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS Environmental Effects of Schuylkill Oil Spill II, June 1972.	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES Use of Dummy Variables in Water Resources	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 SC AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian), W79-00207
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS Environmental Effects of Schuylkill Oil Spill	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES Use of Dummy Variables in Water Resources Studies, W79-00114	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 SC AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian), W79-00207 AQUATIC WEEDS Control of Aquatic Weed by Moth Larvae,
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS Environmental Effects of Schuylkill Oil Spill II, June 1972.	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES Use of Dummy Variables in Water Resources	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 5C AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian), W79-00207 AQUATIC WEEDS
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS Environmental Effects of Schuylkill Oil Spill II, June 1972. W79-00294 5C ALKALIS (BASES) Recovery of Tin from Electroplating Solutions	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES Use of Dummy Variables in Water Resources Studies, W79-00114 2G Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 SC Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian), W79-00207 AQUATIC WEEDS Control of Aquatic Weed by Moth Larvae, W79-00197 4A Cattails (Typha Spp.)Weed Problem or Poten-
Ecosystem Metabolism in a Lake Michigan Dune Pond, W79-00205 5C Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes, W79-00216 5C Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with Domestic Sewage, W79-00220 5C ALGORITHMS Computing Two-Dimensional Dam-Break Flood Waves, W79-00313 8A ALIPHATIC COMPOUNDS Environmental Effects of Schuylkill Oil Spill II, June 1972. W79-00294 5C ALKALIS (BASES)	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii), W79-00402 5D AMMONIUM Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C AMMONIUM COMPOUNDS Removal of Ammonium Sulfide from Wastewater by Liquid Membrane Process, W79-00161 5D AMPHIPODA The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale, W79-00081 5C ANALYTICAL TECHNIQUES Use of Dummy Variables in Water Resources Studies, W79-00114 2G Morphometric Changes in Asterionella For-	Warmth, W79-00340 AQUACULTURE Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System, W79-00071 AQUATIC LIFE A Study of the Fate of Biosolids from Biologically Treated Effluent in Laboratory and Constructed Streams, W79-00407 5C Aquatic Inhabitants of a Mine Waste Stream in Arizona, W79-00426 5C AQUATIC WEED CONTROL Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur into Water Bodies, (In Russian), W79-00207 4A AQUATIC WEEDS Control of Aquatic Weed by Moth Larvae, W79-00197 4A

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Holocene 2C

Freshwater System, 7B

om Biologiy and Con-5C e Stream in

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arvae, 4A m or Poten-2I

AQUIFER CHARACTERISTICS Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,	ASBESTOS CEMENT Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking Water Pine.	Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures, W79-00374 5D
W79-00003	W79-00435 5B	Influence of Methodological Factors on Plate Counting of Aquatic Bacteria: I. Statistical
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite, W79-00256 5B	ASBESTOS-CEMENT PIPE Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water., W79-00013 5A	Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting, (In Spanish), W79-00385
Water-Resources Appraisal of the Wet Moun- tain Valley, in Parts of Custer and Fremont Counties, Colorado,	ASPHALT Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,	Denitrifying Bacteria Can be Enumerated in Nitrite Broth, W79-00498
W79-00274 4B	W79-00474	BANKLICK CREEK (KY)
AQUIFER SYSTEMS Management Aspects of Cyclic Storage of Water in Aquifer Systems, W79-00386 4B	ASTERIONELLA FORMOSA Morphometric Changes in Asterionella Formosa Colonies Under Phosphate and Silicate Limitation, W79-00215 5C	Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky, W79-00341
AQUIFERS Digital Model Studies of Unsteady-State Radial	ACTION OF THE PARTY OF THE PART	California a contraction and pure successful according of
Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers, W79-00111 2F	ATLANTIC SALMON Acute and Chronic Oral Toxicity of Chl- roinated Dibenzofurans to Salmonid Fishes, W79-00062 5C	BARIUM Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report, W79-00003
Kriging in the Hydrosciences, W79-00134 2F	Stamina Tunnel Tests on Hatchery-Reared At- lantic Salmon,	W79-00003
Laboratory Rouge of mentals bank bandwist in	W79-00075 81	Collecting Bark Burner Ash with Electrostation
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined	ATMOSPHERE	Precipitators, W79-00163
Anisotropic Aquifers, W79-00136 2F	Atmospheric Water-Vapor Resources for Rain- fall as They are Related to Water Synthesis in	BARROW STRAIT
ARCADIA LAKE (OKLAHOMA)	Plant Life, Annotated Bibliography. W79-00106 10C	Icebreaking Capability of CCGS 'Labrador' in Western Barrow Strait, October 23-28, 1973,
Arcadia Lake Water-Quality Evaluation,	ATTITUDES	W79-00090 20
	A Comparative Study of Community Response	BASE FLOW
ARCTIC Mixing in an Arctic Fjord, W79-00487 2L	to Water Related Problems, W79-00010 6B	Influence of Strip Mines on Regional Ground Water Flow, W79-00118
ARIZONA	The Demand for Clean Water: The Case of the Charles River,	BASEFLOW
Maps Showing Water-Level Declines, Land	W79-00234 6B	Factors Controlling Variations in River Water
Subsidence, and Earth Fissures in South-Central Arizona,	AUSTRALIA	Quality in Kansas, W79-00006
W79-00251 7C	A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Ar-	BASINS
Aquatic Inhabitants of a Mine Waste Stream in Arizona,	tesian Basin, Central Australia, W79-00112 2F	Simulation of Flows in Ungaged Basins, W79-00331
W79-00426 5C	Field Investigation of Selective Withdrawal,	BATHYMETRY
ARKANSAS The Effects of Heavy Metals on Algae Popula-	W79-00119 4A	Bathymetry as an Indicator of Net Circulation
tions in a South Central Reservoir,	The Isotope Hydrology of the Mercenie Sand- stone Aquifer, Alice Springs, Northern Territo-	in Well Mixed Estuaries, W79-00488 2I
W79-00011 5C	ry, Australia,	BAY OF BOURGNEUF (FR)
ARKANSAS RIVER BASIN Factors Controlling Variations in River Water	W79-00322 2F	First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
Quality in Kansas, W79-00006 5B	Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia,	W79-00295
ASBESTOS	W79-00323 2F	BAY OF FUNDY (CANADA) Bedforms and Their Hydraulic Stability Rela
Is Chrysotile Asbestos Released from Asbestos-Cement Pipe into Drinking Water.,	AUTOMATION Simple Sampler Activation and Recording	tionships in a Tidal Environment, Bay of Fundy, Canada,
W79-00013 5A	System, W79-00480 7B	W79-00336 2I
Determination of Chrysotile Asbestos in Rain- water.	AVAILABLE WATER	BAYS
W79-00014 5A	Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,	Hydraulics of Great Lakes Inlets, W79-00469
Asbestos - A Bibliography, W79-00225 5A	W79-00255 7C	Mechanical Characteristics of Debris Flow.
Characterization of the Release of Chrysotile	BACTERIA Biocenosis of a High Mountain Stream Under	W79-00117
Asbestos from Asbestos-Cement Drinking	the Influence of Tourism. 2. Bacteria as an	Scour of Bed Material in Very Rough Chan
Water Pipe, W79-00435 5B	Index of Water Pollution on the Rybi Potok Stream,	nels, W79-00122
Investigation of Rainwater for the Presence of	-W79-00219 -7 : 1 : 5C	Measurements of Bed Load in Oscillator
Asbestos, W79-00437	Microbial Degradation of DDT, W79-00278 5C	Flow, W79-00141
VA.		

	ALLUVIAL AGRIBERTS	WAS CHOSING TO WAS BACKICLING BOOKS IN A CO.
Numerical Study of Continuous Saltation,	BIOACCUMULATION	Biocenosis of a High Mountain Stream Under
W79-00314	W79-00276	the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The
BEDS		High Tatra Mts, Poland) Polluted with
Bedforms and Their Hydraulic Stability Rela-	Criteria Document for Toxaphene. W79-00281 5A	Domestic Sewage,
tionships in a Tidal Environment, Bay of Fundy, Canada,	W79-00281	W79-00220 or name function the vanish 5C
W79-00336 2L	Criteria Documents for Aldrin/Dieldrin.	Biocenosis of a High Mountain Stream Under
BEDS UNDER WATER	W79-00282	the Influence of Tourism. 4. The Bottom Fauna
Bedforms and Their Hydraulic Stability Rela-	A First Order Mass Balance Model for the	of the Stream Rybi Potok (The High Tatra
tionships in a Tidal Environment, Bay of	Sources Distribution and Fate of PCBs in the	Mts), W79-00221
Fundy, Canada,	Environment, W79-00289 5B	Underwassed as a water our Adams, mass.
W79-00336	The state of the s	The Phosphagens of Some Protozoa as Ecologi- cal Indicators (In French),
BEHAVIOR CHERENCE TO HOLLINGE	Multimedia LevelsMercury,	W79-00423 5A
A Water Quality Model for the South Platte	W79-00291	A THE STATE OF THE PARTY OF THE PARTY OF THE PARTY.
River Basin, Documentation Report, W79-00398	BIOASSAY	Studies on the Pathways and Effects of Cadmi-
Equipm Country, Mestacker	Development of a Manometric Fish Bioassay Technique for Water Pollution,	um in Controlled Ecosystem Enclosures,
BELLMAN'S PRINCIPLE	W79-00008 5A	W79-00066 5B
Dynamic Programming and the Principle of Op- timality: A Systematic Approach,	Continue Control William Co.	Forms of Trace Elements in Soils, Sediments,
W79-00396 6A	Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,	and Associated Waters: An Overview of Their
RENTHIC FAUNA	W79-00073	Determination and Biological Availability,
Diversity and Environments of Benthic Inver-	Discours Bessler of Verfa Mill Efferent at An	W79-00271 5B
tebrate Communities in South Swedish	Bioassay Results of Kraft Mill Effluent at Ar- tificially Elevated Levels of Biosolids,	BIOLOGICAL TREATMENT
Streams,	W79-00406 5C	Oxygen Activated Sludge Considerations for
W79-00209	Manufacture Towns of the William Pines	Industrial Applications,
Biocenosis of a High Mountain Stream Under	Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for	W79-00354 5D
the Influence of Tourism. 4. The Bottom Fauna	the Species,	Control of Nuisance Odors from Ponds by the
of the Stream Rybi Potok (The High Tatra	W79-00443	Use of Bacteria Cultures,
Mts), W79-00221 SC	BIOASSAY TECHNIQUES	W79-00374 5D
	Development of a Manometric Fish Bioassay	Process Design Investigations for Alaska Pulp
BENTHIC FLORA	Technique for Water Pollution,	Mill Wastewater Treatment Facilities,
Benthic Algae in a Pond After the Accumula- tion of Beet-Sugar Factory Wastes,	W79-00008	W79-00412 5D
W79-00216 5C	A Comparative In Vitro Study of the Effects of	BIOMAGNIFICATION
BENTHOS	Various Balanced Saline Solutions on Respira-	Uptake and FAte of DI-2-Ethylhexyl Phthalate
BENTHOS Artificial Substrate Sampler for Benthic Inver-	tion Rates of Liver Tissues of Three Fish Spe- cies,	in Aquatic Organisms and in a Model
tebrates in Ponds, Small Lakes, and Reser-	W79-00454 5C	Ecosystem, W79-00061 5B
voirs,		and district a second first some state of
W79-00074 7B	BIOASSAYS Simple Venturi Device for Mixing Freshwater	BIOMASS
BIBLIOGRAPHIES	and Seawater in an Estuarine Culture System,	Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild
Atmospheric Water-Vapor Resources for Rain-	W79-00071 7B	Rice (Zizania Aquatica Var. Aquatica),
fall as They are Related to Water Synthesis in Plant Life, Annotated Bibliography.	BIOCHEMICAL OXYGEN DEMAND	W79-00214 5C
W79-00106 10C	Investigation of Factors Affecting BOD Mea-	BIOTA
Mathematics as an indicator of him chromotom-	surement and Experience with the 1-Day BOD	Forms of Trace Elements in Soils, Sediments,
Asbestos - A Bibliography, W79-00225	Test, W79-00405	and Associated Waters: An Overview of Their
W79-00225	W79-00405	Determination and Biological Availability,
Summary of U.S. Geological Survey Investiga-	BIOCIDES	W79-00271 5B
tions and Hydrologic Conditions in the Southwest Florida Water Management District	Toxicity of Sodium Pentachlorophenate (NA- PCP) to the Grass Shrimp, Palaemonetes Pugio,	BLACKFOOT RIVER (IDAHO)
for 1977,	at Different Stages of the Molt Cycle,	Hydrochemical Influences on the Fishery
W79-00272 4A	W79-00078	Within the Phosphate Mining Area of Eastern
PCR in Water A Ribligarrahy Volume 3	BIOCONTROL	Idaho, W79-00427
PCB in Water, A Bibliography, Volume 3. W79-00305 5A	Control of Aquatic Weed by Moth Larvae,	to Chrysolle Adecing Released to
to contract the second second second	W79-00197	BLEACHING WASTES
Ozone in Water and Waste Water Treatment, A	BIODEGRADATION	Textile Waste Waters: Treatment and Environ- mental Effects,
Bibliography, Volume 2. W79-00306 5D	Uptake and FAte of DI-2-Ethylhexyl Phthalate	W79-00166
Line policy of the Control of the Co	in Aquatic Organisms and in a Model	
Irrigation Efficiency, A Bibliography, Volume 3.	Ecosystem, W79-00061 5B	Process for Purifying Aqueous Industrial Ef- fluents.
W79-00307	W79-00061	W79-00399 5D
LESSEATER OF STREET AND DESIGNATION OF THE PERSON OF THE P	BIOINDICATORS	
Agricultural and Hydrological Applications of Radar: Final Report,	Nitrate Reductase Activity of Soybeans in	Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against
W79-00464 7B	Relation to other Indicators of Water Stress, W79-00149	Termites, Coptotermes Formosanus Shiraki, in
	Selex of Water Pollution on the Poll Polling	Kraft Pulping and Bleaching Wastes,
BIGHEAD Nutrition and Growth of the Bighead	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an	W79-00404 5D
Aristichthys Nobilis (Rich.) In Bodies of Water	Index of Water Pollution on the Rybi Potok	On the Removal of Lignosulfonates and Car-
of the Dagestan ASSR,	Stream, The beautiful and the state of the s	bohydrates from Sulfite Pulp Wash Waters
W79-00320 2H	W79-00219 5C	with Activated Carbon (Zur Entfernung von

Gen

Under Algae ok (The with

5C Under n Fauna h Tatra

5C Ecologi-5A

Cadmis,

diments, of Their ity, 5B

5D ds by the 5D aska Pulp 5D

Phthalate a Model 5B

itioning in as of Wild

sediments, v of Their ility, 5B

Fishery of Eastern

5C d Environ-3E dustrial Ef-

in Pulping ve Against Shiraki, in

s and Carsh Waters ernung von

Williams.		
Ligninsulfonaten und Kohlenhydraten aus Sul- fitzellstoff-Waschwaessern mittels Aktivkohle), W79-00410	furic Acid Solutions and Mine Acid Polluted Waters, W79-00458	Bedforms and Their Hydraulic Stability Rela- tionships in a Tidal Environment, Bay of Fundy, Canada, W79-00336 2L
Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences, W79-00419 5D	BROWN TROUT Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone Na-	An Analysis of Criticisms of International Fishery Organizations with Reference to Three Agencies Associated with the Canadian West
BOG O Dela Che Mod Che Mon Che BOB	tional Park, W79-00082	Coast Fishery, W79-00394
The Productivity of a Range of Blanket Bog	W 79-00082 SC	W79-00394
Vegetation Types in the Northern Pennines, W79-00202 2I	BRUSHLANDS Brushland Watershed Fire Management Policy	Hydrogeology of the Grande Prairie Area, Algeberta,
BOILERS	in Southern California: Biosocial Considera-	W79-00470 2F
Water Treatment: Iron, Boiler Water and	tions, W79-00449	Mixing in an Arctic Fjord, W79-00487 2L
W79-00176	BUBBLES	CAPILLARY WATER CAPACITY
Criteria Doctumbert for Toppalized of PURE	Seven Problems in Bubble and Jet Drop	Relationships Among Some Physical Properties
BORES Verbrains Characteristics of Dalais Til	Researchers,	of Soil (In Slovenian),
Mechanical Characteristics of Debris Flow,	W79-00319 8B	W79-00451 100 100 100 100 100 100 2G
Af When Bells as in Plant Clark Strong CV	BUTADIENE	control state labilities
BOSTON (MA)	PRO-100 TO THE PRO-10	CAPTAN
The Demand for Clean Water: The Case of the	Biological Effects and Environmental Aspects of 1,3-Butadiene,	Toxicity of the Fungicide Captan to the Dunge-
Charles River,	W79-00292	ness Crab Cancer Magister,
W79-00234 6B	blan sixted find hos Masyn	W79-00065
BOTTOM SEDIMENTS	CADDIS-FLY	CARBON DIOXIDE
	Effect of Environmental Factors on the Dis-	pH Control Systems Using Carbon Dioxide,
Laboratory Study of the Release of Pesticide	tribution of Caddis Fly Larvae in Small Rivers	W79-00365 5D
and PCB Materials to the Wate Column During Dredging and Disposal Operations,	(In Russian),	CARBON RADIOISOTOPES
W79-00286 5A	W79-00147	Photosynthesis and Carbon Metabolism in
THE RESERVE THE PROPERTY OF TH	CADMIUM	Marine and Freshwater Diatoms,
BOULDERS	The Source of American Falls Reservoir Pollu-	W79-00208
Origin and Transport of Large Boulders in	tants.	F187
Mountain Streams,	W79-00004 5B	CARCINOGENESIS
W79-00490 2J	Cracks on Language additions questions	Is Chrysotile Asbestos Released from
BOUNDARY LAYERS	Studies on the Pathways and Effects of Cadmi-	Asbestos-Cement Pipe into Drinking Water., W79-00013
Eddy Production Inside Wall Layers,	um in Controlled Ecosystem Enclosures, W79-00066	A Translation
W70.00133	W79-00066 5B	Determination of Chrysotile Asbestos in Rain-
THE COULTS!	Adsorption of Some Toxic Substances by	water,
BOUNDARY PROCESSES	Waste Components,	W79-00014 Least A. Arabet Ign 5A
Momentum Transfer in a Compound Channel,	W79-00152 5B	CARCINOGENS
W79-00334	CALCAREOUS SOILS	Criteria Document for DDT.
BRACKISH WATE	Water and Physical Properties of the Sod-Cal-	W79-00276 5A
Development of Low Cost Membrane Cleaning	careous Soils of the Crimean Foothills (In Rus-	Criteria Documents for Aldrin/Dieldrin.
Agents, and an analysis of the same of the	CONTRACTOR STORE STORE STORES IN TOURS	W79-00282 5A
W79-00304 3A	W79-00269 2G	
BRACKISH WATER	CALCRETE	Preliminary Study of Selected Potential En- vironmental Contaminants - Optical
Increased Product Water Recovery by Reverse	Hydrogeochemistry of a Calcrete-Containing	Brighteners, Methyl Chloroform, Tri-
Osmosis Using Interstage Ion Exchange Soft-	Aquifer Near Lake Way, Western Australia,	Chloroethylene, Tetrachloroethylene and ion
ing and a Spiractor,	W79-00323 2F	Exchange Resins,
W79-00301 3A	CALIFORNIA (SOUTHERN)	W79-00283 5A
BRINE SHIRMP	CALIFORNIA (SOUTHERN) Brushland Watershed Fire Management Policy	CARDIOVASCULAR MORTALITY
A Procaryotic Intracellular Symbiont of the	in Southern California: Biosocial Considera-	Water Hardness and Cardiovascular Mortality.
Great Salt Lake Brine Shrimp Artemia Salina	tions,	W79-00171 5C
(L.),	W79-00449 6B	
W79-00298 2H	of Mannagard A Leastern Tour Mannagar, would	CARP Survival and Oxygen Consumption of Young
the state of the s	CAMBODIA	Kura Carp Under Various Keeping Conditions
BRITISH COLUMBIA	Hydrogeologic Reconnaissance of the Mekong	(In Pussian)
Regional Response to Forcing in Southern Strait of Georgia,	Delta in South Vietnam and Cambodia, W79-00255	W79-00180 2H
Strait of Georgia, W79-00324 2L	W79-00255	CATION EXCHANGE
a dealers of Madissipping Standard many for the	CAMBRIDGE BAY (N W T)	Studies of Ion Exchange and Chelation Com-
Mass Balance Model for Calculation of Ionic	Mixing in an Arctic Fjord,	pounds Adsorbed on Granular Graphite,
Input Loads in Atmospheric Fallout and	W79-00487	W79-00431 5D
Discharge from a Mountainous Basin, W79-00332	CANADA INGENT OF THE PROPERTY OF THE PROPERTY OF	A Contract of the Party of the
	CAMADA	CATIONS
BROOK TROUT	Strait of Georgia	Evaluation of Donnan Dialysis for the En- richment of Cations.
Acute and Chronic Oral Toxicity of Chl-	W79-00324 2L	W79-00434 SA
roinated Dibenzofurans to Salmonid Fishes.		
W79-00062	Mass Balance Model for Calculation of Ionic	CATTAILS
Genetic and Environmental Factors Involved in	Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,	Cattails (Typha Spp.)Weed Problem or Poten-
Increased Resistance of Brook Trout to Sul-		tial Crop., W79-00198
mondada Resistance of Blook Hout to 341-	W 79-00332	W79-00198

SUBJECT INDEX

CL

CL

CL

CL

CL

CL

CL

CI

CC

CC

co

CLADOSPORIUM
Report of a Dematiaceous Hyphomycete from
the Great Salt Lake, Utah,
W79-00297
2H

2B 3D

CATTAILS		
CENSUS	CHEMICAL PROPERTIES	CHLORIDES
Wetlands as a Naval Environmental Concern,	Geologic Studies to Identify the Source for	On-Site Generation of Hypochlorite Solutions
W79-00201 6G	High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,	by Electrolysis of Seawater, W79-00372
CENTRAL AFRICAN PLATEAU	W79-00003	Flore 1. Tilling Obrestien of Bill Land 1 to St.
A Storm Rainfal Pattern Above the Central African Plateau,	The Environmental Effects of Chromium in	CHLORINATED HYDROCARBON PESTICIDES Toxicity of Sodium Pentachlorophenate (NA-
W79-00126 - 1 Alm ter 100-A 200-1 2B	Tannery Effluents,	PCP) to the Grass Shrimp, Palaemonetes Pugio,
CHANNELIZATION	W79-00156 5C	at Different Stages of the Molt Cycle,
Transport Characteristics of Phosphorus in	Biological Effects and Environmental Aspects	W79-00078
Channelized and Meandering Streams, W79-00391 5B	of 1,3-Butadiene, W79-00292	Identification of Kepone Alteration Products in Soil and Mullet.
11 W79-00476 MEDI OF WILL	M Septiment Collinsia Hammelate Considera	W79-00080 5A
CHARLES (MA) The Demand for Clean Water: The Case of the	CHEMICAL REACTION	Criteria Document for DDT.
Charles River,	Low Toxic Corrosion Inhibitors for Aluminum in Fresh Water.	W79-00276 5A
W79-00234 6B	W79-00091 8G	Criteria Document for Toxaphene.
CHELATION OF SCHOOL SAME A SQUEENING ASSAULT	CHEMICAL REACTIONS	W79-00281 5A
Employing Methylene Phosphonates of Oxyal-	Evaluation of Donnan Dialysis for the En-	Criteria Documents for Aldrin/Dieldrin.
kylated Polyalkylene Polyamines in Chelation and/or Scale Inhibition,	richment of Cations, W79-00434	W79-00282 5A
W79-00052 5F	W79-00434 5A	PCP in Water A Piblicementy Volume 2
Studies of Ion Exchange and Chelation Com-	Investigations of the Molecular Weight, Free	PCB in Water, A Bibliography, Volume 3. W79-00305
pounds Adsorbed on Granular Graphite,	Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,	CHLOROFLUOROCARBON
W79-00431 5D	W79-00436 1B	Chlorofluorocarbons as Hydrologic Tracers A
CHEMICAL ANALYSIS	CHEMICAL WASTES	New Technology,
The Determination of Quantity and Quality of	Sea-Water Neutralization of Effluents from the	W 79-00-01
Great Lakes United States Shoreline Eroded Material.	Industrial Processing of Phosphorite. A Case	CHLOROPHYLL and Descripted loss sangles of
W79-00249 5B	Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the
Groundwater Quality Atlas of Nebraska,	W79-00151	Rybi Potok Waters and the Chlorophyll Con-
W79-00252	Degradation of Aqueous Phenol Solution by	tent in Attached Algae and Seston in Relation
Automated Determination of Selenium in	Gamma Irradiation,	to the Pollution, W79-00218 5C
Water, was and my and leave ranked at	W79-00153	19979-0070-0
W79-00261 5A	UNOX Wastewater Treatment System Per-	CHOWAN RIVER BASIN (NC) Nature and Impact of Rural Stream Inputs on
Preliminary Study of Selected Potential En-	formance Silicone Chemical Complex,	Water Quality,
vironmental Contaminants - Optical	W79-00349 5D	W79-00483
Brighteners, Methyl Chloroform, Tri- Chloroethylene, Tetrachloroethylene and ion	CHEMICALS	CHROMIUM
Exchange Resins, W79-00283	The Biological Effects of Toxic Material Spills,	Controls Drive Platers to Materials Recovery,
W79-00283	W79-00344	W79-00154 5D
Manual of Analytical Quality Control for Pesti-	CHEMOTAXIS	The Environmental Effects of Chromium in
cides and Related Compounds in Human and Environmental Samples,	Studies in Microbial Chemotactic Behavior in Seawater,	Tannery Effluents, W79-00156 5C
W79-00287 5A	W79-00293 5C	
CHEMICAL DEGRADATION	CHERNOZEMS	CHRYSOTILE Is Chrysotile Asbestos Released from
Degradation of Aqueous Phenol Solution by	Reclamation of Meadow-Chernozem	Asbestos-Cement Pipe into Drinking Water.,
Gamma Irradiation, W79-00153	Solonetzes of the Kustanai Oblast, (In Rus-	W79-00013 5A
A Committee of the Comm	sian), W79-00395	Determination of Chrysotile Asbestos in Rain-
CHEMICAL FEED PUMPS		water, W79-00014
Water Treatment: Iron, Boiler Water and Water Analysis.	CHESAPEAKE BAY Annual Subsurface Transport of a Red Tide	W79-00014 5A
W79-00176 5F	Dinoflagellate to its Bloom Area: Water Circu-	Characterization of the Release of Chrysotile
CHEMICAL INHIBITORS (PLANTS)	lation Patterns and Organism Distributions in	Asbestos from Asbestos-Cement Drinking Water Pipe,
Chemical Inhibitors of Plant Transpiration: IV.	the Chesapeake Bay, W79-00317	W79-00435
Action of Alar-85, (In French), W79-00247 2D	Option in Reach V between and a constant	Investigation of Rainwater for the Presence of
11 100-01 10	A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake	Asbestos,
CHEMICAL PRECIPITATION Removal of Complex Copper-Ammonia Ions	Bay,	W79-00437 5A
from Aqueous Wastes with Fly Ash,	W79-00494 2L	CITIES THE STATE OF THE STATE O
W79-00155 5D	CHICAGO (ILL)	Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather
Recovery of Tin from Electroplating Solutions	Tunnel Component of the Tunnel and Reser-	Factors,
and Rinse Waters, W79-00157	voir Plan Proposed by the Metropolitan Sanita- ry District of Greater Chicago, Lower Des	W79-00328 2B
And the property of the proper	Plaines Tunnel System.	Residential Water Conservation,
Hydrolysis of Iron from Acidic Lianors	W79-00465 SD	W79_00440

5D

5D

Dewatering of Sludges from Oil Fried Electric

Power Generating Plants, W79-00360

CHINOOK SALMON

Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho, W79-00428

CLAMS Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for	COASTS Inertial Currents Over the Inner Shelf Near 30 Degree N.	COMMUNITY DEVELOPMENT A Comparative Study of Community Response
the Species,	W79-00133 2L	to Water Related Problems, W79-00010 6B
LERNOPHARKERGOOM INCLA CONTROL	A Study of Coastal Pollution and Agency Inter-	COMMUNITY POWER
CLARIFIERS Clarifier With Suspended Layer of Sediment	face, W79-00389 5G	A Comparative Study of Community Response to Water Related Problems,
(Osvetlitel' so vzveshennym sloem osadka), W79-00421 5D	COFFERDAMS	W79-00010 2723 4034 334124 6B
CLASSIFICATION Optical Classification of Natural Waters, W79-00318 2L	Allowing for the Water Permeability of Frozen Ground Screens During their Formation, W79-00467	COMPARATIVE BENEFITS Critical Analysis of Flotation Performance, W79-00376 5D
CLAYEY	COLD WEATHER CONSTRUCTION	COMPOSITE MEMBRANES
Rational Determination of Underdrainage System from the Hydraulic Point of View: Stu- dies on Underdrainage of Clayey Paddy Soil:	Using Ice as Water-Impermeable Element in Rockfill Dams, W79-00466 8D	Laboratory Studies on Advanced Composite H F Modules for Seawater Reverse Osmosis, W79-00300
III. (In Japanese),	COLIFORMS	COMPOUND CHANNEL
W79-00199 2G	Recovery of Sanitary-Indicator Bacteria from	Momentum Transfer in a Compound Channel,
CLAYS	Streams Containing Acid Mine Water,	W79-00334 8B
Water Relations of Fritted Clays,	W79-00444	Differ and The opinion on Parallemental South
W79-00476 2G	COLLOIDS	COMPUTER MODELS
Seepage Control by Particle Size Selection, W79-00484 4A	Functions and Properties of Drilling Mud. W79-00186 8G	Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A, W79-00188
	COLOR	Hard March Co. EVN ORE I. A Pierr Police
CLIMATOLOGY Climatology of Instantaneous Rainfall Rates,	Waste Water Treatment and Re-use within the	User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B.
W79-00327	Textile Industry,	W79-00189 5B
	W79-00165 5D	Total California County of the
CLOCK-HOURLY PRECIPITATION	Process for Purifying Aqueous Industrial Ef-	Programmer's Manual for EXPLORE-I: A
A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions	fluents.	River Basin Water Quality. Appendix C, W79-00190
W79-00089 2B	W79-00399 5D	Inertial Current Over Unglosen Shell Newson
	COLORADO	Ground-Water Availability in the Hitchcock-
CLOCK TWO-HOURLY PRECIPITATION A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,	Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine Type,	Red Willow, Frenchman Valley, and Meeker- Driftwood Irrigation Districts, Southwest Nebraska,
W79-00089 2B	W79-00140 4C	W79-00260 4B
CLOSED-CYCLE COOLING	And the section of the section of the section of	A Digital Model of Part of the Rio Tempisque
Wet Cooling Tower Backfitting Economics, W79-00233	Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado,	Alluvial Aquifer, Costa Rica, W79-00311 2F
CLOUD PHYSICS	W79-00274 4B	Shippen and analysis and an indicate
Simulation of Cold Cloud Precipitation in a		A Water Quality Model for the South Platte River Basin, Documentation Report,
Three Dimensional Mesoscale Model, W79-00468 2B	Regional Geology Series: Part VII, The	W79-00398
477-00400	Colorado Plateau,	CONDENSATES
COAGULATION	W79-00177	Steam Stripping Reduces Condensate at Weyco
Waste Water Treatment and Re-use within the	COLORADO RIVER	Mill,
Textile Industry, W79-00165 5D	A Periphytic Microflora Analysis of the	W79-00409 3E
Final Report on Field Test Evaluation and	Colorado River and Major Tributaries in Grand Canyon and Vicinity,	CONDENSATION
Operation and Maintenance of Seawater		Nekoosa Cleans Condensates with Steam
Reverse Osmosis and Electrodialysis Pilot	Che II in the control of the control	Distillation, W79-00162
Plants at Wrightsville Beach Test Facility,	COLORADO RIVER BASIN Reject Stream Replacement Study.	WANTOWANT TO A LANGUAGE WAS A SALES OF THE PARTY OF THE P
November 1976, W79-00302 3A	W79-00092	CONFERENCES
Semigrapher are offer many alleger and the side	Trade Transports and the 2000	Research to Anticipate Environmental Impacts
COAL POWERPLANTS Sampling and Modeling of Non-Point Sources	COLORADO RIVER STORAGE Water and Land Resource Accomplishments	of Changing Resource Usage. W79-00085 6G
at a Coal-Fired Utility, W79-00279 5B	1975, Statistical Appendix IIIProject Data. W79-00194	CONJUNCTIVE USE
477-00275	children of Constitution	Conjunctive Use of Ground and Surface
COALS	COMMERCIAL FISHING	Water, W79-00170 4B
Analysis of Radioactive Contaminants in By- Products from Coal-Fired Power Plant Opera-	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion,	PROPERTION -
tions,	W79-00231 6B	CONNATE WATER
W79-00227	Constraints to Welfare Gains Under Extended	Changes in Interstitial Water Salinity of a Mis- sissippi Tidal Marsh,
Sampling and Modeling of Non-Point Sources	to a mark date in 12% his calculation of a manage of the case of t	W79-00338 2L
at a Coal-Fired Utility,	(Anderson),	CONNECTICUT
W79-00279 5B	W79-00235 6E	CONNECTICUT The Effect of Reduced Wetlands and Storage
Treatment of Liquid Wastes from Fossil Fuel Power Plants, W79-00355	Jurisdiction Fisheries Management,	Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
26	The state of the s	States and Total Minigen Secretary in Para-

olutions 5F

ICIDES
te (NAes Pugio,

5C
oducts in

5A 5A

5A 1. 5A

e 3.

Tracers A

am Under sm of the shyll Con-

n Relation

Inputs on 5C

ecovery, 5D romium in

sed from Water., 5A

os in Rain-

Chrysotile Drinking

5B Presence of 5A

uis Urban tic Weather

2B 3D

mycete from

SUBJECT INDEX

DE

D

D

CONSERVATION

CONSERVATION	Long-Term Nitrogen-Rate Experiments with	CRYSTALLIZATION Acidia Linear
Protection of Outdoor Recreation Values of Rivers.	Corn, W79-00500 2G	Hydrolysis of Iron from Acidic Liquors, W79-00228
W79-00093 6B Residential Water Conservation,	CORROSION CONTROL Low Toxic Corrosion Inhibitors for Aluminum	CTENOPHARYNGODON IDELLA Overgrowing of the Kara Kum Canal and Some
W79-00440 Wales Related Providence 3D	in Fresh Water, W79-00091 BG	Aftereffects of Introducing the White Amur into Water Bodies, (In Russian),
CONSTRUCTION COSTS	COST-BENEFIT ANALYSIS	W79-00207
Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and Physical Features.	Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Ex-	CULTIVATED LANDS Water and Land Resource Accomplishments
W79-00193	perience, W79-00232 6G	1975, Statistical Appendix I. W79-00192 3F
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant	COST REPAYMENT Water and Land Resource Accomplishments	CURRENTS (WATER) Inertial Currents Over the Inner Shelf Near 30
Legislation, W79-00246 5G	1975, Statistical Appendix II-Finances and Physical Features.	Degree N. W79-00133
Cost Estimates for Construction of Publicly-	W79-00193	Regional Response to Forcing in Southern
Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.	Water and Land Resource Accomplishments 1975, Statistical Appendix III-Project Data.	Strait of Georgia,
W79-00248 5G	W79-00194 3F	CURVES
Progress and Problems in the Study of Plant-	COSTA RICA	Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined
Water Interrelations (In Bulgarian), W79-00187 21	A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica, W79-00311 2F	Anisotropic Aquifers, W79-00136 2F
CONTAMINATION (AIR)	Wald Water Continued and Brond william the	DAM FAILURE
Wastewater Odor Problem Solving - Process Modification Versus Air Treatment,	COSTS Conceptual and Statistical Issues in Developing	Analysis of Flood Resulting from the Toccoa
W79-00373	Environmental Measures - Recent U.S. Experience,	Falls, Georgia, Dam Break, W79-00262 2E
CONTINENTAL SHELF	W79-00232 6G	Model of the Flooding Caused by the Failure of
Inertial Currents Over the Inner Shelf Near 30 Degree N,	Wet Cooling Tower Backfitting Economics, W79-00233 5G	the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,
W79-00133	" brands and Lordon Pril Control	W79-00263 2E
CONTROL Management Plan for Control and Treatment of	Residential Water Conservation, W79-00440 3D	Computing Two-Dimensional Dam-Break Flood Waves,
Toxic Substances, W79-00346	COTTON Stomatal and Nonstomatal Regulation of Water	W79-00313
CONTROL SYSTEMS	Use in Cotton, Corn and Sorghum,	DAMINOZIDE Chemical Inhibitors of Plant Transpiration: IV.
Simple Sampler Activation and Recording	W79-00016 2I	Action of Alar-85, (In French),
System, W79-00480 7B	CRABS Toxicity of the Fungicide Captan to the Dunge-	Shoulation of Cold Cloud Proceedings by a
CONTROLS	ness Crab Cancer Magister, W79-00065 5C	Free-Surface Seepage Problem,
Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Sta-	CRITICISMS TS 100-8" W	W79-00496 8D
tion Wastewater Treatment System, W79-00357 5D	An Analysis of Criticisms of International Fishery Organizations with Reference to Three	Photosynthesis and Carbon Metabolism in
COOLING	Agencies Associated with the Canadian West	Marine and Freshwater Diatoms, W79-00208 5C
Direct Cooling with Ground Water,	Coast Fishery, W79-00394 6E	DARTERS THE STATE OF THE PARTY
W79-00173 8C Housing Project to Utilize Ground Water.	CROP PRODUCTION	Species Diversity Indices of the Fish Popula- tions of Streams Draining Selected Test Areas
W79-00178 8C	Effect of Soil-Injected Ethylene on Sugarbeet (Beta Vulgaris L.) Yield Parameters, W79-00296 3F	on Eglin Air Force Base Reservation Florida, W79-00277
COOLING TOWERS	Today Virginia and Harris and Paperson and	DATA COLLECTIONS
Wet Cooling Tower Backfitting Economics, W79-00233 5G	CROP RESPONSE Water and Land Resource Accomplishments	Data Base System for State Water Quality Management Information System.
COPPER Removal of Complex Copper-Ammonia Ions	1975. Summary Report. W79-00191 3F	W 79-00222
from Aqueous Wastes with Fly Ash,		Microbial Degradation of DDT, W79-00278 5C
Aquatic Inhabitants of a Mine Waste Stream in	W79-00363	Products from constraint from Philipping
Arizona, W79.00426		Microbial Degradation of DDT,
CORN (FIELD)	Long-Term Nitrogen-Rate Experiments with Corn,	DDA
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,	W79-00500 : 2G	Microbial Degradation of DDT, W79-00278 5C
W79-00016	CROP VALUE Water and Land Resource Accomplishments	DOWN Phone Page 19 Mars Louis Lines Power Phone
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two	1975, Statistical Appendix I.	Microbial Degradation of DDT, W79-00278 5C

MA.P

d Some e Amur 4A shments 3F

Near 30 2L

Southern 2L

own Data aconfined 2F e Toccoa

Failure of ally 19-20,

2E

Pam-Break

8A

ration: IV.

8D

abolism in 5C

sh Popula-Test Areas Florida, 7C

ter Quality

\$C

5C

5C

5C

DOT STATE BY WARRY GRAN Under Case-Opt	Carlo Solor and Phill Two Workship and	Resource Analysis Water and Torresonate
Criteria Document for DDT.	Laboratory Studies on Advanced Composite H	Continuous Culture of Marine Diatoms Under
W79-00276 Stoody granted and hading	F Modules for Seawater Reverse Osmosis, W79-00300	Silicon Limitation. 3. A Model of Si-Limited Diatom Growth,
Containing Acid Dyns	There is the work Total Turbert Street	W79-00229 5C
Microbial Degradation of DDT,	Increased Product Water Recovery by Reverse	TO CONTROL OF THE PARTY OF THE
W79-00278 5C	Osmosis Using Interstage Ion Exchange Soft-	First Ecological Data on the Oyster Ponds in
DEBRIS FLOW	ing and a Spiractor,	the Bay of Bourgneuf (In French),
Mechanical Characteristics of Debris Flow,	W79-00301 3A	W79-00295 2L
W79-00117 21	High Temperature Eletrodialysis-Phase VI.	DIBENZOFURANS
DYKAMIC PROGRAMMENG CAMPER	W79-00303 3A	Acute and Chronic Oral Toxicity of Chl-
DECISION-MAKING	Stell Builton Capacia Grange Entirely and State	roinated Dibenzofurans to Salmonid Fishes,
A Comparative Study of Community Response	Development of Low Cost Membrane Cleaning	W79-00062 5C
to Water Related Problems,	Agents, Florett,	Versone, Mealen (In Stanish) on which with
W79-00010 6B	W79-00304 3A	DIEL CYCLES
The Development of the Electrical Power	DESALINATION PLANTS	Diel Cycles of Inorganic Nitrogen Uptake in a
System in the Pacific Northwest, A Public Pol-	Vapor Compression Energy Reduction by Ver-	Natural Phytoplankton Population Dominated
icy Perspective,	tical Tube Foam Evaporation of Seawater,	by Gonyaulax Polyedra, W79-00210
W79-00143 6E	W79-00015 3A	-W79-00210 5C
Madelia des Osseindes I Destrict Matri	A STATE OF THE PARTY OF THE PAR	DIEL MIGRATION
Modeling for Organizational Decision-Making: Profits vs. Social Values in Resource Manage-	Final Report on Field Test Evaluation and	Diel Cycles of Inorganic Nitrogen Uptake in a
ment,	Operation and Maintenance of Seawater	Natural Phytoplankton Population Dominated
W79-00243 6A	Reverse Osmosis and Electrodialysis Pilot	by Gonyaulax Polyedra,
The first Proposed by the Million Control of	Plants at Wrightsville Beach Test Facility, November 1976,	W79-00210 5C
DEGRADATION (DECOMPOSITION)	W79-00302 3A	Venter Distiller with Constitute of the elementaries
Identification of Kepone Alteration Products in	Regional Causage Sames Value 577, The	DIELDRIN
Soil and Mullet,	DESALINATION PROCESSES	Criteria Documents for Aldrin/Dieldrin. W79-00282
W79-00080 31 feet 1 common what 1 2 5A	Increased Product Water Recovery by Reverse	W79-00282
Phytoplankton Extracellular Release and Its	Osmosis Using Interstage Ion Exchange Soft-	DIFFUSION
Relation to the Seasonal Cycle of Dissolved Or-	ing and a Spiractor,	Pollution of Groundwater Through Nonlinear
ganic Carbon in a Eutrophic Lake,	W79-00301 3A	Diffusion,
W79-00213 5C	Development of Low Cost Membrane Cleaning	W79-00110 5B
Capital Services of the Control of t	Agents,	
DELAWARE RIVER BASIN	W79-00304	DINOFLAGELLATES
Water Resources Data for Pennsylvania, Water	More of M.	Annual Subsurface Transport of a Red Tide
Year 1977Volume 1. Delaware River Basin. W79-00266	DESIGN	Dinoflagellate to its Bloom Area: Water Circulation Potters and Occasion Distributions in
W 79-00200	Design Considerations for Wastewater Treat-	lation Patterns and Organism Distributions in the Chesapeake Bay,
DEMAND	ment Systems at Existing Fossil Power Plants,	W79-00317 5C
Residential Water Conservation,	W79-00358 5D	The state of the s
W79-00440 3D	DETERMINISTIC MODELING	DISCHARGE (WATER)
DEMINERALIZATION	Stormwater Modeling,	A Novel Method of Estimating the Discharge
Treatment of Water or Aqueous Systems,	W79-00381 5B	of Water from Mound Springs of the Great Ar-
W79-00039 5F	The in Collins, Consend Supplying	tesian Basin, Central Australia,
	DETRITUS	W79-00112 2F
Desalination Process Using Thermally	A Comparison by Size Class and Volume of	Field Investigation of Selective Withdrawal,
Regenerable Resins,	Detritus Versus Phytoplankton in Chesapeake Bay,	W79-00119
W79-00057	W79-00494 2L	THE TOTAL STATE OF ST
DENITRIFICATION		An Estimate of Annual Runoff from England
Denitrifying Bacteria Can be Enumerated in	DEWATERING	
Nitrite Broth,	Groundwater Pumping Techniques for Excava-	W79-00124 2E
W79-00498 2G	tions and Other Works,	On Geostrophic Adjustment in Sea Straits and
elements from the Committee of the Property of	W79-00185 8G	Wide Estuaries. Part I: One-Layer System,
DENSITY CURRENTS	Case History: Ash Disposal from an Oil Fried	W79-00131 2L
Internal Fronts in Two-Layer Flo, W79-00486	Central Station.	WITH OUR SAMERAS
W 12-00480	W79-00361 5E	DISCOUNT RATES
DEPARTMENT OF ENERGY RESEARCH	10.00	Land Prices Substantially Underestimate the
Summaries of Physical Research in the	Sludge Treatment by Supersonic Jet-Flame,	Value of Environmental Quality,
Geosciences.	W79-00403 5E	W79-00244 6C
W79-00101 10F	DIALYSIS	DISINFECTANT
DESALINATION	Evaluation of Donnan Dialysis for the En-	On-Site Generation of Hypochlorite Solutions
Vapor Compression Energy Reduction by Ver-	richment of Cations,	by Electrolysis of Seawater,
tical Tube Foam Evaporation of Seawater,	W79-00434 5A	W79-00372 5F
W79-00015		DISTRIBUTION
THE PARTY WAS ASSESSED.	DIATOMS Rhotosynthesis and Corbon Metabolism in	New Technology: Ozono/HV Chemical Oxida
Process for the Treatment of Water Solution by	Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms.	New Technology: Ozone/UV Chemical Oxida- tion Wastewater Process for Metal Complexes,
Ion Exchange,	W79-00208 SC	Organic Species and Disinfection,
W79-00054 5F	the transfer of the best and the part fall of	W79-00369
Desalination Process Using Thermally	Biocenosis of a High Mountain Stream Under	(AC-2200)
Regenerable Resins,	the Influence of Tourism. 3. Attached Algae	DISPERSION
W79-00057	Communities in the Stream Rybi Potok (The	Longitudinal Dispersion of Fluid Particles in
Polos Conses Polos	High Tatra Mts, Poland) Polluted with	Mountain Streams: I. Theory and Field
Reject Stream Replacement Study. W79-00092		Evidence, W79-00308 5B
W79-00092	W79-00220 5C	W 79-00308

SUBJECT INDEX

DISPERSION

Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean Motion and Its Application, W79-00309 5B	DREDGE SPOIL Vegetative Stabilization of Dredge Spoil in North Florida, W79-00337 5G	DYES Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes, W79-00053 5D
DISSOLVED ORGANIC CARBON Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Or- ganic Carbon in a Eutrophic Lake, W79-00213	DREDGING Laboratory Study of the Release of Pesticide and PCB Materials to the Wate Column During Dredging and Disposal Operations, W79-00286	Textile Waste Waters: Treatment and Environ- mental Effects, W79-00166 3E
DISSOLVED OXYGEN Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish), W79-00079 2L	Vegetative Stabilization of Dredge Spoil in North Florida, W79-00337 5G	Dynamic Programming and the Principle of Op- timality: A Systematic Approach, W79-00396 6A EARTHWORMS
Effects of Dissolved Oxygen in the Oxygena- tion Activated Sludge Process, W79-00351 5D	DREISSENA Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,	Effects of Municipal Sewage Effluent Irriga- tion on the Trace Metal Content of Earthworms, W79-00009 5C
DISTILLATION Vapor Compression Energy Reduction by Vertical Tube Foam Evaporation of Seawater, W79-00015 3A	W79-00068 5C DRILLING Water Analytical Data as a Tool in Drilling and Production Economics,	ECOLOGY Research to Anticipate Environmental Impacts of Changing Resource Usage. W79-00085
Water Distiller with Cone Shaped Condenser, W79-00045 5F	W79-00168 8G Regional Geology Series: Part VII, The Colorado Plateau,	Fish and Wildlife Inventory of the Seven-Coun- ty Region Included in the Central Florida Phosphate Industry Area-Wide Environmental
Nekcosa Cleans Condensates with Steam Distillation, W79-00162	W79-00177 8B DRILLING FLUIDS	Impact Study. Volumes I and II, W79-00100 5C
DISTRIBUTION Effect of Environmental Factors on the Dis- tribution of Caddis Fly Larvae in Small Rivers (In Russian), W79-00147 21	Functions and Properties of Drilling Mud. W79-00186 8G DRIP IRRIGATION Drip Irrigation System,	Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation, W79-00246
Distributional Implications of the Extended Economic Zone: Some Policy and Research Is- sues in the Fishery, W79-00236 6E	W79-00038 3F DROPS (FLUIDS) Seven Problems in Bubble and Jet Drop Researchers, W79-00319 8B	ECONOMIC IMPACT Economic Impacts of Pulp and Paper Industry Compliance with Environmental Regulations. Volume 1. Summary and Aggregate Industry Impact Analyses.
Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion, W79-00237 6E	DROUGHT RESISTANCE Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum, W79-00016	W79-00430 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 4C
Distributional Implications of the Extended Economic Zone: Some Policy and Research Is- sues in the Fishery: Discussion, W79-00238 6E	Water Relations and Physiological Activity of Potatoes, W79-00017 2I	ECONOMICS Heat Pump Accessories Can Save You Money, W79-00174 8C
DIVERSITY Species Diversity Indices of the Fish Popula- tions of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida, W79-00277 7C	DROUGHT TOLERANCE Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum, W79-00016 21	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion, W79-00231 6B Wet Cooling Tower Backfitting Economics, W79-00233 5G
Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes, W79-00217 SC	Water Relations and Physiological Activity of Potatoes, W79-00017 21 DRY MATTER	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),
BOOR COUNTY Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite, W79-00256 5B	Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian), W79-00018 2I DUNES An Investigation of Primary Production and	W79-00235 Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery, W79-00236 6E
DRAINAGE Rational Determination of Underdrainage System from the Hydraulic Point of View: Stu- dies on Underdrainage of Clayey Paddy Soil:	W79-00205 SC DURATION CURVES	Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion, W79-00237 6E
III. (In Japanese), W79-00199 2G DRAWDOWN	Rainfall Frequencies for the Persian Gulf Coast of Iran, W79-00123	Distributional Implications of the Extended Economic Zone: Some Policy and Research Is- sues in the Fishery: Discussion, W79-00238
Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers, W79-00136 2F	DUSTS Collecting Bark Burner Ash with Electrostatic Precipitators, W79-00163 5D	The Optimal Pricing of Undepletable Externalities, W79-00239 6C
2F		11.7-10237 OC

ELLI COPPY C

SUBJECT INDEX ENVIRONMENTAL CONVERGENCE eport on Field Test Evaluation and Resource Analysis: Water and Energy as on and Maintenance of Seawater Cosmosis and Electrodialysis Pilot at Wrightsville Beach Test Facility, Linked Resources, a poster of the state of t ENERGY CONSERVATION A Comment of the 3A Energy Conservation and Outdoor Recreation, emperature Eletrodialysis-Phase VI, How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer), Consumption for Electrodialysis of W79-00418 Sulfite Liquors (Energozatraty na elekotrabotannogo shcheloka sul'fitno-ENERGY CONSUMPTION oznogo proizvodstva), Energy Conservation and Outdoor Recreation, Resistance of the Cation-Selective **Energy Consumption of Advanced Wastewater** Treatment at Ely, Minnesota, Membrane During Electrodialysis of Sulfite Liquor (Elektrosoprotivlenie ka-W79-00102 elektivnoy membrany MK-40 pri elek-ze otrabotannogo sul'fitnogo shcheloka), ENERGY CRISIS A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State of Pennsylvania, W79-00442 OFISHING tallic Electrofishing Booms and Acces-ENERGY POLICY A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State Operated Water Purification System, of Pennsylvania, W79-00442 8A e Generation of Hypochlorite Solutions ENERGY SUPPLY e Generation of Controlysis of Seawater, Water/Energy Management and Evaluation Model for Pennsylvania, W79-00007 6D ON MICROSCOPY hrysotile Asbestos Released from hrysotile Asbestos tos-Cement Pipe into Drinking Water., 5A Stochastic Processes in Water Resources Engineering. gineering. W79-00380 8B nination of Chrysotile Asbestos in Rain-0014 5A An Estimate of Annual Runoff from England y Consumption of Advanced Wastewater y Consumption of the consumption Water Administration in England and Wales Impacts of Reorganization, W79-00384 ON STANDARDS ptimal Pricing of Undepletable Externali-ENTERIC BACTERIA anni shipateli enin kanal se igili mula yendi Recovery of Sanitary-Indicator Bacteria from Streams Containing Acid Mine Water, W79-00444 ater Separation Technology: The Options ENTITLEMENTS ble - Part 2, 5G Property Rules, Liability Rules, and Environmental Economics, W79-00241 val of Ammonium Sulfide from Wasteby Liquid Membrane Process,
5D ENTRAINMENT W79-00485 y Conservation and Outdoor Recreation, ENVIRONMENT ing at the Positive Side of Energy Regula-Impact Analyses. 0411 3E W79-00430 y Consumption for Electrodialysis of

Mathematical Model for Simulating Water

Demand-Supply and Energy Uses for the State

of Pennsylvania, W79-00442 8A

Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,	Final Report on Field Test Evaluation and Operation and Maintenance of Seawater
W79-00240 6E	Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility,
Property Rules, Liability Rules, and Environ- mental Economics,	November 1976, W79-00302
W79-00241	AND Expenses the Comments of the State of th
Natural Resource Economics: The Upsetting Discipline,	High Temperature Electrodialysis-Phase VI, W79-00303
W79-00242 6B	Energy Consumption for Electrodialysis of
ECOSYSTEMS The Biological Effects of Toxic Material Spills, W79-00344 5C	Spent Sulfite Liquors (Energozatraty na elek- trodializ otrabotannogo shcheloka sul'fitno- tsellyuloznogo proizvodstva), W79-00416
EDDIES Sulf act) Seast boys primit as to	Amount to the state of the Stat
Eddy Production Inside Wall Layers, W79-00333 8B	Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenie ka-
EFFECTS AUTTAVIAVS	tionoselektivnoy membrany MK-40 pri elek-
Lake Superior Regulation Effects,	trodialze otrabotannogo sul'fitnogo shcheloka), W79-00417
W79-00388 4C	NO William control of more has a sealong
Tunnel Component of the Tunnel and Reser-	ELECTROFISHING Nonmetallic Electrofishing Booms and Acces-
voir Plan Proposed by the Metropolitan Sanita- ry District of Greater Chicago, Lower Des	sory Tackle,
Plaines Tunnel System.	W79-00069 7B
W79-00465 5D	ELECTROLYSIS
EFFLUENTS ALL WORLD HAT TOTAL MINERAL A	Battery Operated Water Purification System, W79-00043
A Socio-Economic Approach to Water Pollu-	W79-00043 5F
tion Law Enforcement in England and Wales, W79-00245 5G	On-Site Generation of Hypochlorite Solutions by Electrolysis of Seawater,
Modeling and Monitoring of Toxic Spills and	W79-00372 5F
Toxic Effluents,	ELECTRON MICROSCOPY
W79-00343 5B	Is Chrysotile Asbestos Released from
ELECTRIC POWERPLANTS Analysis of Radioactive Contaminants in By-	Asbestos-Cement Pipe into Drinking Water., W79-00013 5A
Products from Coal-Fired Power Plant Opera-	Determination of Chrysotile Asbestos in Rain- water,
W79-00227	W79-00014 5A
ELECTRICAL CONDUCTANCE	ELY
Electrical-Resistivity Surveys for Groundwater in the Deccan Trap Country of Sangli District,	Energy Consumption of Advanced Wastewater
Maharashtra,	Treatment at Ely, Minnesota, W79-00102 5D
W79-00107 4B	EMISSION STANDARDS
ELECTRICAL POWER SYSTEM	The Optimal Pricing of Undepletable Externali-
The Development of the Electrical Power	ties,
System in the Pacific Northwest, A Public Policy Perspective,	W79-00239 6C
W79-00143 6E	
ELECTROCHEMISTRY	Oil/Water Separation Technology: The Options Available - Part 2,
Continuous Electrochemical Synthesis Using a	W79-00158 5G
Packed Granular Electrode, W79-00432 5D	Removal of Ammonium Sulfide from Waste-
ELECTRODES	water by Liquid Membrane Process, W79-00161 5D
Collecting Bark Burner Ash with Electrostatic	ENERGY
Precipitators, W79-00163 5D	Energy Conservation and Outdoor Recreation, W79-00096 6G
Ion Selective Electrodes in Water Quality Anal-	Physiphetes Cubachle haraching windphys
ysis, W79-00223 5A	Looking at the Positive Side of Energy Regula- tion,
Studies of Ion Exchange and Chelation Com-	W79-00411
pounds Adsorbed on Granular Graphite, W79-00431 5D	Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elek- trodializ otrabotannogo shcheloka sul'fitno-
Continuous Electrochemical Synthesis Using a Packed Granular Electrode,	tsellyuloznogo proizvodstva), W79-00416 5D
W79-00432 5D	A Mathematical Model for Simulating Water

Liquids

nviron-

of Op-

Irriga-

SC

Impacts

6G

n-Coun-Florida

nmental

tures of

Grant

Industry

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Industry

e Land

4C

Money,

Extended

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Extended iscussion

Extended

earch Is-

ed Fishe-

Policy Is-

Extended earch Is-

Externali-

6C

ELECTRODIALVSIS

Controls Drive Platers to Materials Recovery W79-00154

6E

5C

5G

5D

ENVIRONMENTAL ECONOMICS

ENVIRONMENTAL ECONOMICS	ESTERS	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an
Property Rules, Liability Rules, and Environ- mental Economics,	The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve,	Index of Water Pollution on the Rybi Potok
W79-00241 NOTTA VALEADS V. 6E		Stream, W79-00219
Natural Resource Economics: The Upsetting	ESTIMATED COSTS	Biocenosis of a High Mountain Stream Under
Discipline, W79-00242 6B	Cost Estimates for Construction of Publicly- Owned Treatment Facilities, 1974 'Needs' Sur-	the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The
Land Prices Substantially Underestimate the	vey, Final Report to the Congress. W79-00248	High Tatra Mts, Poland) Polluted with
Value of Environmental Quality, W79-00244 6C	ESTIMATING TENGES OF STOURS STOURS SEEDE	Domestic Sewage, W79-00220
Construction of the Africa September 1	Conceptual and Statistical Issues in Developing	Biocenosis of a High Mountain Stream Under
ENVIRONMENTAL EFFECTS Research to Anticipate Environmental Impacts	Environmental Measures - Recent U.S. Experience,	the Influence of Tourism. 4. The Bottom Fauna
of Changing Resource Usage.	W79-00232	of the Stream Rybi Potok (The High Tatra Mts).
W79-00085	ESTUARIES On Geostrophic Adjustment in Sea Straits and	W79-00221
On the Environmental Efficiency of Economic Systems,	Wide Estuaries. Part I: One-Layer System,	EVALUATION
W79-00230 med to the one of the and all 6G	W79-00131 2L	Oxygen Activated Sludge Considerations for Industrial Applications,
ENVIRONMENTAL ENHANCEMENT	Bedforms and Their Hydraulic Stability Rela-	W79-00354 5D
Water and Land Resource Accomplishments 1975. Summary Report.	tionships in a Tidal Environment, Bay of Fundy, Canada,	Optimal Operation of Shelbyville and Carlyle
W79-00191 3F		Lakes, W79-00392
ENVIRONMENTAL POLLUTION	The Effect of Reduced Wetlands and Storage	EVAPORATION
Analysis of Radioactive Contaminants in By-	Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,	A Simple Model for Shallow Lake Evapora-
Products from Coal-Fired Power Plant Opera- tions,	W79-00441 2L	tion, W79-00326
W79-00227 5A	,,	EVAPOTRANSPIRATION
ENVIRONMENTAL RESOURCES	in Well Mixed Estuaries, W79-00488 2L	Transpiration and Evaporation of Sewage Ef-
Public Outdoor Recreation Benefits of Federal Water Resource Projects.	On Geostrophic Adjustment in Sea Straits and	fluent, W79-00088 5D
W79-00094 6E	Wide Estuaries: Theory and Laboratory Ex-	EXCAVATION
ENZYMES	periments. Part II - Two-Layer System, W79-00497 2L	Groundwater Pumping Techniques for Excava-
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,	ETHYLENE	tions and Other Works, W79-00185
W79-00016 21	Effect of Soil-Injected Ethylene on Sugarbeet	EXTERNALITIES
Water Relations and Physiological Activity of	(Beta Vulgaris L.) Yield Parameters, W79-00296 3F	Property Rules, Liability Rules, and Environ-
Potatoes,	EUROPE	mental Economics, W79-00241 6E
W79-00017	Acid Precipitation in the Netherlands,	FALLOUT
Seasonal Changes in Respiratory Enzyme Ac- tivity and Productivity in Lake Washington	W79-00138 5A	Mass Balance Model for Calculation of Ionic Input Loads in Atmospheric Fallout and
Microplankton,	Nutrient Loading/Lake Trophic Condition	Discharge from a Mountainous Basin,
W79-00212	Relationships with Special Reference to the In-	W79-00332
An Investigation of Primary Production and	fluence of Flushing Rate, W79-00001	FEDERAL CONSTRUCTION GRANT PROGRAM
Ecosystem Metabolism in a Lake Michigan	Effects of N:P Atomic Ratios and Nitrate	Economic Analysis of Selected Features of
Dune Pond, W79-00205	Limitation on Algal Growth, Cell Composition,	Municipal Wastewater Construction Grant Legislation,
EQUITY	and Nitrate Uptake, W79-00211	W79-00246 5G
Land Prices Substantially Underestimate the	William T. Language amounted M. Committee and State of the State of th	FEDERAL FUNDS
Value of Environmental Quality, W79-00244 6C	tivity and Productivity in Lake Washington	Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and
HIGH WOLLD'S	Microplankton, W79-00212	Physical Features. W79-00193
EROSION Methodical Problems in the Evaluation and	Phytoplankton Extracellular Release and Its	
Mapping of Erosion-Endangered Lands (In Russian),	Relation to the Seasonal Cycle of Dissolved Or-	FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1972
W79-00462 2J	ganic Carbon in a Eutrophic Lake, W79-00213	Economic Analysis of Selected Features of Municipal Wastewater Construction Grant
EROSION RATES	Phytophilous Fauna in Ponds Fertilized with	Legislation,
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded		EN THE PARTY
Material,	Charles of Francisco of State (1974) and	Cost Estimates for Construction of Publicly- Owned Treatment Facilities, 1974 'Needs' Sur-
W79-00249 5B	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the	vey, Final Report to the Congress.
Determination of Spoil-Bank Erosion Rates in	Rybi Potok Waters and the Chlorophyll Con-	MANAGEMENT COLUMN TO STATE OF THE STATE OF T
Ohio by Using Interbank Sediment Accumula- tions,	tent in Attached Algae and Seston in Relation to the Pollution,	FERRIC OXIDE Hydrolysis of Iron from Acidic Liquors,
W79-00495 2J	W79-00218 5C	W79-00228 5D

FINITO A USWY

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		AND THE LINE IN THE PARTY OF TH
FERTILIZATION	Bioassay Results of Kraft Mill Effluent at Ar-	tion Rates of Liver Tissues of Three Fish Spe-
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two	tificially Elevated Levels of Biosolids, W79-00406	cies, W79-00454 5C
Long-Term Nitrogen-Rate Experiments with	Hydrochemical Influences on the Fishery	FISHERIES Addition ATAG BOOJ
Corn, W79-00500 2G	Within the Phosphate Mining Area of Eastern	Constraints to Welfare Gains Under Extended
Baroling and the state of the force of the first state of the first st	Idaho,	Jurisdiction Fisheries Management: Discussion,
FERTILIZERS Use of Hydrolysis Lignin for Purification of	W79-00427	W79-00231 6B
Effluents from Ammonia Production and the	FISH DIETS	Constraints to Welfare Gains Under Extended
Preparation of Complex Fertilizers (Primenenie	Stamina Tunnel Tests on Hatchery-Reared At-	Jurisdiction Fisheries Management: Discussion
gidroliznogo lignina dlya ochistki stochnykh	lantic Salmon, W79-00075	(Anderson), W79-00235
vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),	White To are seen I need to singer I benefit to	Water well Development Desired
W79-00402 5D	Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water	Distributional Implications of the Extended
Profile Accumulation of Fertilizer-Derived	of the Dagestan ASSR,	Economic Zone: Some Policy and Research Is- sues in the Fishery.
Nitrate and Total Nitrogen Recovery in Two	W79-00320 2H	W79-00236 6E
Long-Term Nitrogen-Rate Experiments with	FISH DISEASES	Distributional Implications of Extended Fishe-
Corn, W79-00500 2G	A Pilot Plant Trial for Ozone Sterilization of	ries Jurisdiction: Some Research and Policy Is-
FILTRATION OF A PARTY THE STATE OF THE STATE	Fish Hatchery Water, W79-00455 5G	sues: Discussion, W79-00237 6E
FILTRATION Water 1977.	W79-00455	W79-00237
W79-00342	FISH HATCHERIES	Distributional Implications of the Extended
Control of the Contro	A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water,	Economic Zone: Some Policy and Research Is- sues in the Fishery: Discussion,
New Developments in Oil Interception by Fil- tration.	W79-00455 5G	W79-00238 6E
W79-00364 5D	FISH MANAGEMENT	Control to Walter Color Made President
Molecular Fractionation by Staged Ultrafiltra-	Constraints to Welfare Gains Under Extended	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
tion.	Jurisdiction Fisheries Management: Discussion,	W79-00240 6E
W79-00367 5D	W79-00231 6B	An Analysis of Criticisms of International
Characterization of Performance of Full-Scale	Constraints to Welfare Gains Under Extended	Fishery Organizations with Reference to Three
Tertiary Wastewater Granular Media Filters,	Jurisdiction Fisheries Management: Discussion	Agencies Associated with the Canadian West
W79-00371 5D	(Anderson), W79-00235 6E	Coast Fishery, W79-00394
EPA's Goal for Suspended Solids is Not Met		To place of the Proposition of the Sales of the Sales of
with Media Filtration,	Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-	FISHES
W79-00414 5D	sues in the Fishery,	Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish),
FINITE DIFFERENCE ANALYSIS	W79-00236 6E	W79-00079 2L
Comparison of Finite-Element and Finite-Dif-	Distributional Implications of Extended Fishe-	FISSURES (GEOLOGIC)
ference Schemes. Part II: Two-Dimensional Gravity Wave Motion,	ries Jurisdiction: Some Research and Policy Is-	Maps Showing Water-Level Declines, Land
W79-00130 2L	sues: Discussion, W79-00237 6E	Subsidence, and Earth Fissures in South-Cen-
FINITE DIFFERNCE ANALYSIS	W 1990 Color	tral Arizona, W79-00251
Comparison of Finite-Element and Finite-Dif-	Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-	A PRO CLASS NAME DOLLARS MANY, AND M.
ference Schemes. Part I: One-Dimensional	sues in the Fishery: Discussion,	FJORDS
Gravity Wave Motion, W79-00129 2L	W79-00238 6E	Mixing in an Arctic Fjord, W79-00487
W79 (0004	Constraints to Welfare Gains Under Extended	
FINITE ELEMENT ANALYSIS Comparison of Finite-Element and Finite-Dif-	Jurisdiction Fisheries Management,	FLAME PHOTOMETRY Flame-Photometric Method for the Determina-
ference Schemes. Part I: One-Dimensional	W79-00240 6E	tion of Magnesium in Spent Liquors of Sulfite
Gravity Wave Motion,	FISH PHYSIOLOGY	Pulp Mills (Plamennofotometricheskii method
W79-00129 2L	Stamina Tunnel Tests on Hatchery-Reared At-	opredeleniya magniya v shchelokakh sul'fitno- tsellyuloznogo proizvodstva),
Comparison of Finite-Element and Finite-Dif-	lantic Salmon, W79-00075	W79-00415 5A
ference Schemes. Part II: Two-Dimensional	10/19/2001 - name	FLASH FLOODS
Gravity Wave Motion, W79-00130 2L	Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated	Model of the Flooding Caused by the Failure of
Charles and the second	Stream: The Firehole River of Yellowstone Na-	the Laurel Run Reservoir Dam, July 19-20,
A New Finite Element Technique for the Solu- tion of Two-Phase Flow Through Porous	tional Park, W79-00082	1977, near Johnstown, Pennsylvania, W79-00263
Media,	W79-00082 5C	W79-00263 2E
W79-00135 2F	FISH POPULATIONS	FLOCCULATION
FINITE ELEMENT MODEL	Collection Bucket for Use with Tow Nets for Larval Fish,	Waste Water Treatment and Re-use within the Textile Industry,
A Model for Evaluating the Effect of Land	W79-00070 7B	W79-00165 5D
Uses on Flood Flows, W79-00450 4C	FISH STAMINA	FLOOD CONTROL
BANKER AND	Stamina Tunnel Tests on Hatchery-Reared At-	Water and Land Resource Accomplishments
LINH	lantic Salmon,	1975. Summary Report.
Fish and Wildlife Inventory of the Seven-Coun- ty Region Included in the Central Florida	W79-00075	W79-00191
Phosphate Industry Area-Wide Environmental	FISH TISSUE RESPIRATION	Lake Level Control and ManagementA Case
Impact Study. Volumes I and II,	A Comparative In Vitro Study of the Effects of	Study, W79-00390
W79-00100 5C	Various Balanced Saline Solutions on Respira-	W79-00390 4A

Optimal Operation of Shelbyville and Carlyle	Removal of Fluoborate from Plating Waste-	FLY ASH
Lakes, W79-00392 4A	water: Technique and Mecahnism, W79-00378	Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash,
FLOOD DATA	PLOW I and no recognitial landers has the	W79-00155
Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,	Measurements of Bed Load in Oscillatory Flow.	FOREIGN COUNTRIES Rainfall Frequencies for the Persian Gulf Coast
W79-00262 2E	W79-00141 23	of Iran, W79-00123
LOOD DISCHARGE	Air Entrainment in Radial Flow Towards In-	w /9-00123
Analysis of Flood Resulting from the Toccoa	takes, woll-growtell on sizet lougel saidigte	FOREST FIRES
Falls, Georgia, Dam Break, W79-00262 2E	W79-00315	Brushland Watershed Fire Management Policy in Southern California: Biosocial Considera-
PLOOD PLAINS	Internal Fronts in Two-Layer Flo,	tions, and the Management of the Advisory
Flood Regions in Jamaica,	W79-00486 8B	W79-00449 6B
W79-00330 2E	On Geostrophic Adjustment in Sea Straits and	FOREST MANAGEMENT
Momentum Transfer in a Compound Channel,	Wide Estuaries: Theory and Laboratory Ex- periments. Part II - Two-Layer System,	Our Reclamation Future: The Missing Bet on Trees.
W79-00334 . 8B	W79-00497 2L	Trees, W79-00086 4C
PLOOD REGIONS	FLOW CONTROL	Modeling for Organizational Decision-Making:
Flood Regions in Jamaica,	Flow Reducing Devices Particularly Useful as	Profits vs. Social Values in Resource Manage-
W79-00330 2E	Drip Emitters for Drip Irrigation,	ment,
FLOOD WAVES	W79-00031 3F	W79-00243 6A
Computing Two-Dimensional Dam-Break	Drin Irrigation System	NOT FOR COME
Flood Waves,	Drip migation System,	FOREST SOILS Grazing and Logging Effects on Soil Surface
W79-00313 8A	W79-00038 3F	Changes in Central Colorado's Ponderosa Pine
A Market I of the Charter Down (Traffic advantage during)	FLOW DURATION	Type,
FLOODS Analysis of Flood Resulting from the Toccoa	Low-Flow Characteristics of Streams on the	W79-00140
Falls, Georgia, Dam Break,	Olympic Peninsula, Washington,	and the second second second second
W79-00262 2E	W79-00258 2E	Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of
Flood Regions in Jamaica,	FLOW MEASUREMENT	Silvicultural Practices, (In Russian),
W79-00330 2E	The Vertical Planar Motion Mechanism; A	W79-00401 The year of the sent level of the grant 4C
	Dynamic Test Apparatus for Evaluating Cur-	FOREST WATERSHEDS
FLOODWATER	rent Meters and Other Marine Instrumentation,	Influence of Nitrogen Fertilization on the
Model of the Flooding Caused by the Failure of	W79-00224 7B	Quality and Quantity of Streamflow from a
the Laurel Run Reservoir Dam, July 19-20, 1977, near Johnstown, Pennsylvania,	Shunt Meters with Segmental Orifices,	Forested Watershed,
W79-00263	W79-00335 3F	W79-00448 5B
A CONTRACTOR OF THE PARTY OF TH	Court of Aut. Lawrence & Statement of September 1	FORESTRY
FLORIDA	FLOW RATES	Our Reclamation Future: The Missing Bet on
Fish and Wildlife Inventory of the Seven-Coun-		Trees.
ty Region Included in the Central Florida	Streams, W79-00257	W79-00086 4C
Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,	W/9-0023/	
W79-00100 5C	FLOWMETERS	FORESTS
and the second s	The Vertical Planar Motion Mechanism; A	Summary of Study Findings, Phase I Report:
Use of Dummy Variables in Water Resources	Dynamic Test Apparatus for Evaluating Cur-	Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands,
Studies,	rent Meters and Other Marine Instrumentation,	W79-00195 4C
W79-00114 2G	W79-00224 7B	200-200-2
Vegetation of Southeastern Florida Parts II -	FLUCTUATIONS	FOSSIL FUELS
V In the bearing that the sellow challeng	Pressure Fluctuations Beneath Submerged	Treatment of Liquid Wastes from Fossil Fuel
W79-00196 21	Jump,	Power Plants, W79-00355 5D
Summary of U.S. Geological Survey Investiga-	W79-00316	W 12-00333
tions and Hydrologic Conditions in the	FLUMES	Use of Wastewater Treatment Ponds at TVA
Southwest Florida Water Management District	Pressure Fluctuations Beneath Submerged	Fossil Fueled Power Plants,
for 1977,	Jump,	W79-00356 5D
W79-00272 4A	W79-00316 8B	Design Considerations for Wastewater Treat-
Vegetative Stabilization of Dredge Spoil in	the mexical ve at the named by about	ment Systems at Existing Fossil Power Plants,
North Florida.	FLUOBORATE	W79-00358 5D
W79-00337 5G	Removal of Fluoborate from Plating Waste-	PRAINCE A PRO OAN
	water: Technique and Mecahnism, W79-00378	FRAINS LAKES (MI)
FLOTATION	# 17-00376	Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Or-
Oil/Water Separation Technology: The Options Available - Part 2.	FLUORIDES	ganic Carbon in a Eutrophic Lake.
W79-00158 5G	Sea-Water Neutralization of Effluents from the	W79-00213 5C
30	Industrial Processing of Phosphorite, A Case	
Waste Water Treatment and Re-use within the	Study in the Practical Use of Basic Knowledge	PRAZIL ICE
Textile Industry,	in Analytical and Marine Chemistry, W79-00151	Frazil Ice Formation: A Review, W79-00120 20
W79-00165 5D	W 19-00131	The state of the s
Factors Influencing Induced Air Flotation,	FLUSHING RATE	FREE RADICAL
W79-00375 5D	Nutrient Loading/Lake Trophic Condition	Investigations of the Molecular Weight, Free
SAND IN TRANSPORTED IN CONTRACTOR OF THE PARTY OF	Relationships with Special Reference to the In-	Radical and Metal Interactions of Isolated
Critical Analysis of Flotation Performance,	fluence of Flushing Rate,	Aquatic and Soil Fulvic Acid,
W79-00376 5D	W79-00001 5C	W79-00436

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FREQUENCY ANALYSIS	GAS CHROMATOGRAPHY	GRAPHICAL ANALYSIS
High-Flow Frequencies for Selected Streams in	Tracing Sewage Effluent Recharge - Tucson,	Type-Curve Analysis of Time-Drawdown Data
Oklahoma, was side and the office out the format	Arizona,	for Partially Penetrating Wells in Unconfined
W79-00273 2E	11/20 00200	Anisotropic Aquifers,
	W 19-00299 Sie. C. Int. service / Menter 5A	W79-00136 2F
FREQUENCY CURVES	Chlorofluorocarbons as Hydrologic Tracers A	All and the second seco
Climatology of Instantaneous Rainfall Rates,	New Technology,	GRASSES
W79-00327	THE COLUMN	Vegetative Stabilization of Dredge Spoil in
tional Park,	W79-00461	North Florida,
FRESHWATER FISH	GASES	W79-00337
Nonmetallic Electrofishing Booms and Acces-	Transfer of Gases at Natural Air-Water Inter-	
sory Tackle,	fanne	GRAVEL PACES
W79-00069	W79-00127 2L	Water Well Development Decisions,
Collection Bucket for Use with Tow Nets for	Table of the second	W79-00167 8B
Larval Fish,	Laboratory Studies of Gas Tracers for Reaera-	THE WORLD S. CO. B. 45TA WORLDON
W79-00070 1250 100 100 100 100 100 7B	tion, A say a more than A Mataway and	GRAVELS
W 75-00070	W79-00270 5A	Seepage Control by Particle Size Selection,
Quantitative Comparison of Seining and Un-	STREET, ST.	W79-00484 4A
derwater Observation for Stream Fishery Sur-	GASTROPODS	GRAVITY WAVES
veys,	Effects of Feeding and of Chemical Stimulation	Comparison of Finite-Element and Finite-Dif-
W79-00072 7B	on the Oxygen Uptake of Nassarius Reticulatus	ference Schemes. Part I: One-Dimensional
with the Revent Mantabaretry Control of the Princip	(Gastropoda: Prosobranchia),	Gravity Wave Motion,
FRITTED CLAY	W79-00083 5C	W79-00129 2L
Water Relations of Fritted Clays,		A CONTRACTOR OF THE PROPERTY O
W79-00476 2G	GENERAL RECLAMATION STATISTICS	Comparison of Finite-Element and Finite-Dif-
Meaning of Chances independ in Triburation of the	Water and Land Resource Accomplishments	ference Schemes. Part II: Two-Dimensional
FROTH FLOTATION	1975, Statistical Appendix II-Finances and	Gravity Wave Motion,
Water 1977.	Physical Features.	W79-00130 2L
W79-00342 5D	W79-00193 3F	THE TAX AND ADDRESS OF THE PARTY OF THE PART
The state of the s	bereath first the art from the first	GREAT LAKES
Critical Analysis of Flotation Performance,	GEOCHEMISTRY	Environmental Management Strategy for the
W79-00376 5D	The Isotope Hydrology of the Mereenie Sand-	Great Lakes System.
PROZEN ZBOUND	stone Aquifer, Alice Springs, Northern Territo-	W79-00084 5G
FROZEN GROUND	ry, Australia,	
Allowing for the Water Permeability of Frozen	W79-00322 2F	Generation and Propagation of Downwelling
Ground Screens During their Formation,	A CONTRACTOR OF THE PERSON NAMED IN COLUMN TWO IS NOT THE OWNER.	Fronts,
W79-00467 8D	Hydrogeochemistry of a Calcrete-Containing	W79-00128 . 2H
FULVIC ACIDS	Aquifer Near Lake Way, Western Australia,	Refuse to the Restroyate on a consultation
Investigations of the Molecular Weight, Free	W79-00323 2F	Numerical Computation of Three-Dimensional
Radical and Metal Interactions of Isolated	TEMPORE THE STREET	Circulation in Lake Erie: A Comparison of a
Aquatic and Soil Fulvic Acid,	GEOPHYSICS	Free-Surface Model and a Rigid-Lid Model,
W79-00436	Summaries of Physical Research in the	W79-00132 2H
W 13-00430	Geosciences.	The Determination of Quantity and Quality of
FUNGI	W79-00101 10F	The Determination of Quantity and Quality of
Microbial Degradation of DDT,	Pelescifichter of selected and their vertical selections	Great Lakes United States Shoreline Eroded Material,
W79-00278	GEOTHERMAL STUDIES	W79-00249 SE
mitest'y	Energy Conversion System,	W 79-00249 3E
FUNGICIDES	W79-00037 4B	A First Order Mass Balance Model for the
The Toxicity of Manganese Ethylenebisdithic-	SKOT MENNYTHER RESOLUTIONS	Sources Distribution and Fate of PCBs in the
carbamate to the Adult Newt, Triturus	Process and System for Recovery of Energy	Environment,
Cristatus,	from Geothermal Brines and Other Water Con-	W79-00289
W79-00064 5C	taining Sources by Direct Contact with a Work-	arms (Ox fatt
	ing Fluid Below the Critical Pressure,	Isotopic Composition of Sulfur in Precipitation
Toxicity of the Fungicide Captan to the Dunge-	W79-00049 4B	Within the Great Lakes Basin,
ness Crab Cancer Magister,	printed and in the advance regulation of the	W79-00339
W79-00065 5C	Growth and Diets of Trout from Contrasting	
W39-6-0017	Environments in a Geothermally Heated	Lake Superior Regulation Effects,
FURROW IRRIGATION	Stream: The Firehole River of Yellowstone Na-	W79-00388
Control of Furrow Infiltration by Compaction,	tional Park, The transfer to the second transfer transfer to the second transfer	Warning to the Park Charles of the Warning of the W
W79-00481 3F	W79-00082 5C	Hydraulics of Great Lakes Inlets,
FURROWS	microfield negotial and a largery	W79-00469
	Summaries of Physical Research in the	GREAT LAKES BASIN
Control of Furrow Infiltration by Compaction,	Geosciences.	
W79-00481 3F	W79-00101 10F	Isotopic Composition of Sulfur in Precipitation
GALVESTON	but yaller, in them of Canar and Francay	Within the Great Lakes Basin,
Point Source Analysis. Inventory, Water De-	Digging for New Sources of Energy.	W79-00339 5/
mands, and Problem Area Identification.	W79-00175 8B	GREAT LAKES REGION
(Areawide Waste Treatment Plan for the	The second secon	
Greater Houston Area. Section 208, PL 92-500.	GOAL PROGRAMMING	Within the Great Lakes Basin,
W79-00104 6D	Modeling for Organizational Decision-Making:	W79-00339
The same segal to the property of the plant sebilat	Profits vs. Social Values in Resource Manage-	30
GAMMA RAYS	ment,	GREAT PLAINS
Degradation of Aqueous Phenol Solution by	W79-00243 6A	Influence of Strip Mines on Regional Ground
Gamma Irradiation,	WYSOUTH.	Water Flow
W79-00153 5D	GONYAULAX POLYEDRA	W79-00118
Dropers and District and Other Westernament and	Diel Cycles of Inorganic Nitrogen Uptake in a	DE 14030-451
The Radiation-Induced Degradation of Lignin	Natural Phytoplankton Population Dominated	
in Aqueous Solutions,	by Gonyaulax Polyedra,	The Historic Level of Great Salt Lake, Utah,
W79-00164 5D	W79-00210 5C	W79-00264 21

Eco (Dr He: W7

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GREAT SALT LAKE (UTAH)

GREAT SALT LAKE (UTAH)	ment District and Vicinity, Florida, September,	GROWTH RATES
Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,	1977, W79-00275	Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),
W79-00297 2H	NUTAL PEUF	W79-00018 21
GREEN ASH	Hydrogeochemistry of a Calcrete-Containing	Growth and Diets of Trout from Contrasting
Growth Aspects of Green Ash Seedlings in	Aquifer Near Lake Way, Western Australia, W79-00323	Environments in a Geothermally Heated
Years Varying in Moisture (In Russian),	2078 (2014)	Stream: The Firehole River of Yellowstone Na-
W79-00018 2I	Formation of a Vermiculite Mineral from	tional Park,
GREEN RIVER BASIN (KY)	Ground Water Components (In Russian), W79-00382 2K	W79-00082
Operating Model for the Green River Basin	SAND TO MANY THINKS IN TRANSPORT OF THE PROPERTY OF THE PROPER	A Method of Measuring Bacterial Growth in
Reservoir System, W79-00452 4A	Hydrogeology of the Grande Prairie Area, Al-	Aquatic Environments Using Dialysis Culture,
W79-00452	berta, W79-00470 2F	W79-00109 5A
GROUNDWATER	- STATES TO A SOUT AND THE SAME THE ASSOCIATION STATES	GULF OF MEXICO
Geologic Studies to Identify the Source for High Levels of Radium and Barium in Illinois	GROUNDWATER AVAILABILITY	Inertial Currents Over the Inner Shelf Near 30
Ground-Water Supplies: A Preliminary Report,	Ground-Water Availability in the Hitchcock- Red Willow, Frenchman Valley, and Meeker-	Degree N, W79-00133
W79-00003 5A	Driftwood Irrigation Districts, Southwest	Harwiller Observation for Strang Fibling Miles
Electrical-Resistivity Surveys for Groundwater	Nebraska, W79-00260 4B	GYMNODINIUM The Toxicity of Phthalates to the Marine
in the Deccan Trap Country of Sangli District,	W79-00260 4B	Dinoflagellate Gymnodinium Breve,
Maharashtra,	Water-Resources Appraisal of the Wet Moun-	W79-00063
W79-00107 4B	tain Valley, in Parts of Custer and Fremont	HABITATS
Pollution of Groundwater Through Nonlinear	Counties, Colorado,	Rearing of Chinook Salmon in Tributaries of
Diffusion, W79-00110	W79-00274	the South Fork Salmon River, Idaho,
W79-00110	GROUNDWATER CONTAMINATION	W79-00428
Digital Model Studies of Unsteady-State Radial	Oil-Troubled Water,	HAIL
Flow to Partially Penetrating Wells in Uncon- fined Anisotropic Aquifers,	W79-00169 5B	Hailstone Size inferred from Dents in Cold-
W79-00111 2F	GROUNDWATER MOVEMENT	Rolled Aluminum Sheet, W79-00139 7B
Of the second se	On the Two-Dimensional Groundwater Move-	Streething Prospers, the Patientonia Kitatori
Influence of Strip Mines on Regional Ground- Water Flow.	ment, W79-00108 2F	HALOPHILES
W79-00118 5G	W 79-00108	Report of a Dematiaceous Hyphomycete from the Great Salt Lake, Utah,
Market of the Market Canada La Res Tolking	A New Finite Element Technique for the Solu-	W79-00297 2H
Kriging in the Hydrosciences, W79-00134 2F	tion of Two-Phase Flow Through Porous Media,	HAMILTON MARSHES (NJ)
a We assemble to A sixt and the materials	W79-00135 2F	Growth, Mortality, and Biomass Partitioning in
Direct Cooling with Ground Water, W79-00173 8C	# MAY (CROSS)	Freshwater Tidal Wetland Populations of Wild
W 79-00173	Oil-Troubled Water, W79-00169 5B	Rice (Zizania Aquatica Var Aquatica),
Regional Geology Series: Part VII, The	W79-00169 5B	W79-00214 5C
Colorado Plateau, W79-00177 8B	Relationship of Rainfall and Lake Groundwater	HARDNESS TOTAL TOT
The state of the s	Seepage, W79-00489 5B	Water Hardness and Cardiovascular Mortality, W79-00171 5C
New Approach Gets Results in Utah Well, W79-00181	W79-00489 5B	W79-00171 5C
W79-00181	GROUNDWATER RESOURCES	HATCHERY-REARED ATLANTIC SALMON
Maps Showing Water-Level Declines, Land	Ground-Water Data, 1974-76, Indian Wells Val-	Stamina Tunnel Tests on Hatchery-Reared At- lantic Salmon,
Subsidence, and Earth Fissures in South-Cen- tral Arizona,	ley, Kern, Inyo, and San Bernardino Counties, California,	W79-00075 8I
W79-00251 7C	W79-00253 7C	HEAT PUMPS
Grandwater Quality Asia of Naharibali	Hydrogeologic Reconnaissance of the Mekong	Heat Pump Accessories Can Save You Money,
Groundwater Quality Atlas of Nebraska, W79-00252 7C	Delta in South Vietnam and Cambodia,	W79-00174 8C
THE RESERVE AND ADDRESS OF THE PARTY AND ADDRESS OF THE PARTY.	W79-00255 7C	Housing Project to Utilize Ground Water.
Ground-Water Levels in Wyoming, 1977, W79-00259 7C	Geology and Ground Water in Door County,	W79-00178
Dydrawar of Great Caber Tales	Wisconsin, with Emphasis on Contamination	HEAT TRANSFER
Water Resources Data for Pennsylvania, Water	Potential in the Silurian Dolomite,	Energy Conversion System,
Year 1977Volume 2. Susquehanna and Potomac River Basins.	W79-00256 5B	W79-00037 4B
W79-00265 7C	Water-Resources Appraisal of the Wet Moun-	Process and System for Recovery of Energy
Water Resources Data for Pennsylvania, Water	tain Valley, in Parts of Custer and Fremont	from Geothermal Brines and Other Water Con-
Year 1977Volume 1. Delaware River Basin.	Counties, Colorado, W79-00274	taining Sources by Direct Contact with a Work-
W79-00266 7C	W79-00274 4B	ing Fluid Below the Critical Pressure, W79-00049
Water Resources Data for Wisconsin, Water	GROUNDWOOD MILLS	
Year 1977.	How Kind to the Resources is the Grinding Process. (Hvor ressursvennlig er slipeproses-	HEAT TREATMENT
W79-00267 7C		Sludge Treatment by Supersonic Jet-Flame, W79-00403
Water Resources Data for Pennsylvania, Water	W79-00408 3E	Warning of Acres Connect Statement De-
Year 1977Volume 3. Ohio River and St.	GROWTH RATE	HEATED WATER
Lawrence River Basins. W79-00268 7C	A Note on Effects of Sewage Effluent Irriga-	Process and System for Recovery of Energy from Geothermal Brines and Other Water Con-
NAME OF TAXABLE	tion on Specific Gravity and Growth Rate of	taining Sources by Direct Contact with a Work-
Potentiometric Surface Map of the Floridan	White and Red Oaks, W79-00425 SE	ing Fluid Below the Critical Pressure,
Aquifer in the St. Johns River Water Manage-	W79-00425 5E	W79-00049 4B

ings in

trasting Heated one Na-

5C

owth in ulture, 5A

Near 30

Marine
5C
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8I
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of Energy ater Conh a Work-

		III AND
Ecology of Dreissena Polymorpha (Pall.) (Dreissenidae, Bivalvia) in Lakes Receiving	HYDRAULIC STRUCTURES	Water Resources Data for Pennsylvania, Water
Heated Water Discharges,	Hydraulic Model Investigation of a Two-Way Drop Inlet for Floodwater Retarding Structure	Year 1977Volume 2. Susquehanna and Potomac River Basins.
W79-00068	No. 3, Banklick Creek Watershed, Boone and	W79-00265 7C
HEATING KONTENION	Kenton Counties, Kentucky, W79-00341	Water Resources Data for Pennsylvania, Water
Heat Pump Accessories Can Save You Money,	CREATING THE PARTY OF THE PARTY	Year 1977Volume 1. Delaware River Basin.
W79-00174 - 200-01 - 200-01 - 200-01 - 8C	HYDRAULICS These Dimensional Court Channel Element	W79-00266 7C
Housing Project to Utilize Ground Water.	Three-Dimensional Open Channel Flow, W79-00312 8B	Water Resources Data for Wisconsin, Water
Physiosolitina. Marten apartheriga a Nortabal deservira	Attention and Consposition for Prescoting Malor	Year 1977.
HEAVY METALS The Effects of Heavy Metals on Algae Popula-	Stochastic Processes in Water Resources En- gineering.	W79-00267
tions in a South Central Reservoir,	W79-00380 8B	Water Resources Data for Pennsylvania, Water Year 1977Volume 3. Ohio River and St.
W79-00011	Hydraulics of Great Lakes Inlets,	Lawrence River Basins.
Evaluation of Donnan Dialysis for the En-	W79-00469 8B	W79-00268 7C
richment of Cations, W79-00434 5A	HYDROELECTRIC POWER	HYDROLOGY
(AXDIDA)	Water and Land Resource Accomplishments	The Application of Linear Programming to
Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from	1975, Statistical Appendix II-Finances and Physical Features.	Run-Off Management, W79-00393
Municipal Sewage Sludge Ash, w79-00459	W79-00193 3F	A Consul Time Dimensional Bione Simulator
W79-00459 5B	HYDROGEN ION CONCENTRATION	A General Two Dimensional River Simulator, W79-00397 2E
HIGH FLOW	pH Control Systems Using Carbon Dioxide,	all high Assent amount area as a
High-Flow Frequencies for Selected Streams in Oklahoma,	W79-00365 5D	HYDROLYSIS Hydrolysis of Iron from Acidic Liquors,
W79-00273 2E	Genetic and Environmental Factors Involved in	W79-00228 5D
HIGHWAY EFFECTS	Increased Resistance of Brook Trout to Sul- furic Acid Solutions and Mine Acid Polluted	Water Martin (or Albertania Park State
Summary of Study Findings, Phase I Report:	Waters,	HYPERTENSION Water Hardness and Cardiovascular Mortality,
Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands.	W79-00458 5C	W79-00171 50
W79-00195 4C	HYDROGEN SULFIDE	HYPHOMYCETES
HOUSTON		Report of a Dematiaceous Hyphomycete from
Point Source Analysis. Inventory, Water De-	water by Liquid Membrane Process, W79-00161 5D	the Great Salt Lake, Utah,
mands, and Problem Area Identification. (Areawide Waste Treatment Plan for the	OF THE STATE OF TH	W79-00297 2F
Greater Houston Area. Section 208, PL 92-500.	HYDROGEOLOGY Shortest Path Problems in Hydrogeology,	ICE district of Assertmental to transport
W79-00104 6D	W79-00137 6A	Frazil Ice Formation: A Review, W79-00120
HUMAN PATHOLOGY	Geology and Ground Water in Door County,	UM, septiment and the first At
Biological Effects and Environmental Aspects of 1,3-Butadiene,	Wisconsin, with Emphasis on Contamination	Inland Ice Sheet Thinning Due to Holocene Warmth,
W79-00292 5C	Potential in the Silurian Dolomite, W79-00256	W79-00340 20
HUMIC ACIDS	- Service Control of the Control of	ICE COVER
Investigations of the Molecular Weight, Free	Water-Resources Appraisal of the Wet Moun- tain Valley, in Parts of Custer and Fremont	Icebreaking Capability of CCGS 'Labrador' is
Radical and Metal Interactions of Isolated	Counties, Colorado,	Western Barrow Strait, October 23-28, 1973,
Aquatic and Soil Fulvic Acid, W79-00436	W79-00274 4B	W79-00090
HYBRID RESINS	Potentiometric Surface Map of the Floridan	Inland Ice Sheet Thinning Due to Holocen-
Desalination Process Using Thermally	Aquifer in the St. Johns River Water Manage-	Warmth, W79-00340
Regenerable Resins,	ment District and Vicinity, Florida, September,	Philade I are Country of the Market
W79-00057	W79-00275	ICE LOADS Icebreaking Capability of CCGS 'Labrador' is
HYDRAULIC DESIGN The Vertical Planar Motion Mechanism; A	A Digital Model of Part of the Rio Tempisque	Western Barrow Strait, October 23-28, 1973,
Dynamic Test Apparatus for Evaluating Cur-	Alluvial Aquifer, Costa Rica,	W79-00090 20
rent Meters and Other Marine Instrumentation,	W79-00311 2F	ICEBREAKERS
W79-00224 7B	Hydrogeochemistry of a Calcrete-Containing	Icebreaking Capability of CCGS 'Labrador' i
HYDRAULIC JUMP	Aquifer Near Lake Way, Western Australia, W79-00323	Western Barrow Strait, October 23-28, 1973, W79-00090
Pressure Fluctuations Beneath Submerged Jump,	(620-4710) PERM I	HASA
W79-00316 8B	Hydrogeology of the Grande Prairie Area, Al- berta,	The Source of American Falls Reservoir Polls
HYDRAULIC MODELS	W79-00470 2F	tants,
The Vertical Planar Motion Mechanism; A	HYDROLOGIC CYCLE	W79-00004
Dynamic Test Apparatus for Evaluating Cur- rent Meters and Other Marine Instrumentation.	Modelling the Water Quality of the Hydrologi-	Hydrochemical Influences on the Fisher
W79-00224 7B	cal Cycle.	Within the Phosphate Mining Area of Easter
Hydraulic Model Investigation of a Two-Way	W79-00379 5B	Idaho, W79-00427
Drop Inlet for Floodwater Retarding Structure	HYDROLOGIC DATA	A TALL TALL TO
No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,	Applications of Remote Sensing to Hydrologic Planning.	Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,
W79-00341 8B	W79-00099 7B	W79-00428

ILLINOIS	New Developments in Oil Interception by Fil-	INFORMATION RETRIEVAL
Geologic Studies to Identify the Source for	tration or to pulse its valuable of Silectical	Data Base System for State Water Quality
High Levels of Radium and Barium in Illinois	W79-00364	Management Information System.
Ground-Water Supplies: A Preliminary Report,	INDUSTRIAL WASTES	W79-00222 Sand 5G
W79-00003 5A	Treatment of Solids-Liquid-Gas Mixtures,	INHIBITION OF TARM THE COMPONETAR
Is Chrysotile Asbestos Released from	W79-00022 5D	The Effect of Cyclohexane Derivatives on
Asbestos-Cement Pipe into Drinking Water.,	THE PROPERTY OF THE PROPERTY O	Selection of Bacterial Groups Forming Ac-
W79-00013 5A	Treatment of Elisuent,	tivated Sludge Microflora,
Determination of Chrysotile Asbestos in Rain-	W79-00024	W79-00159 - 10010 bille to a sylve son SD
water,	Method and Composition for Preventing Water	THE RESIDENCE PROPERTY OF THE PARTY OF THE P
W79-00014 5A	Contaminated with Industrial Waste Seeping	INLET-HARBOR RESONANCE Hydraulics of Great Lakes Inlets,
Our Resignation Future: The Missing Ret on	Through Soil Containing Said Water,	W70_00460 / 00 / 612/0 (\$13/6 0 21.311. 9D
Our Reclamation Future: The Missing Bet on Trees,	W79-00034 5G	soos m a South Cannal Kenersch
W79-00086 4C	Clarification Process, Management In column 1997	INLETS (WATERWAYS)
Dutyloush of Rolling and Darlam is hamself W	W79-00041 5D	Hydraulics of Great Lakes Inlets,
Tunnel Component of the Tunnel and Reser-	and Million Franchison, Malley, and Markey, and	W79-00469 8B
voir Plan Proposed by the Metropolitan Sanita- ry District of Greater Chicago, Lower Des	Color Removal Process, W79-00042 5D	INSECTS
Plaines Tunnel System.	W79-00042 III A SSIBOREA LEVEL MAR 100-3D	Control of Aquatic Weed by Moth Larvae,
W79-00465 5D	Method for Clarifying Aqueous Waste Liquids	W79-00197
M characters.	Containing Acid Dyes,	Municipal Stowage Studge Ash. Earth of a
ILLINOIS RIVER	W79-00053 5D	Biocenosis of a High Mountain Stream Under
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for	Process for Removing Mercury and Mercury	the Influence of Tourism. 4. The Bottom Fauna
the Species,	Salts from Liquid Effluents,	of the Stream Rybi Potok (The High Tatra
W79-00443	W79-00056 5D	Mts), W79-00221
Activities about the data in the description	Osnetic and Coverage of the Paris of the Control of	HC TOTAL TOT
IMPERVIOUS MEMBRANE	Phytophilous Fauna in Ponds Fertilized with	Biologically Active Substances in Pulping
Water Harvesting for Afforestation: II. Sur-	Sugar Factory Wastes, W79-00217 SC	Waste Liquors. I. Substances Active Against
vival and Growth of Trees, W79-00475	LEAD NOT THE RESIDENCE OF THE PARTY OF THE P	Termites, Coptotermes Formosanus Shiraki, ir
The state of the second	Water 1977.	Kraft Pulping and Bleaching Wastes,
IMPERVIOUS MEMBRANES	W79-00342 5D	W79-00404
Water Harvesting for Afforestation: I. Efficien-		INSTRUMENTATION
cy and Life Span of Asphalt Cover, W79-00474	Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud	Solid State Event Recorder for Rainfall Mea
W79-00474 3B	Precipitation,	surement,
IMPOUNDMENT IMPACTS	W79-00350 5D	W79-00125
Impacts of Impoundment to Vertebrate	W. Parallelle St. Co. 10 In House of the Co.	
Animals and their Habitats in the Snake River	Pretreatment Land Application of Textile Plant	A Comparison of Ceramic and Teflon in Sitt Samplers for Pore Water Determinations,
Canyon, Washington,	Wastes, W79-00362 5E	21/20 00225
W79-00146 6G	THE PROPERTY OF THE PROPERTY AND ADDRESS OF THE PROPERTY OF TH	W 79-00323 YDO.101177.4 W 37
IMPOUNDMENT STUDY	Effect of Whey Application on Chemical Pro-	Shunt Meters with Segmental Orifices,
Arcadia Lake Water-Quality Evaluation,	perties of Soils and Crops,	W79-00335
W79-00463 SC	W79-00363	Instrumentation and Controls for Philadelphia
INCINERATION	Pretreatment of Industrial Wastes with Ozone,	Electric Company Eddystone Generating Sta
Leaching Characteristics of Various Heavy	W79-00368 5D	tion Wastewater Treatment System,
Metals, Non-Heavy Metals and Anions from	Contable, Coloman	W79-00357
Municipal Sewage Sludge Ash,	INDUSTRIAL WATER	V79@1075
W79-00459 5B	Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and	Simple Sampler Activation and Recording
INDIA ASSESSED	Physical Features.	System, W79-00480 71
Electrical-Resistivity Surveys for Groundwater	W79-00193	W 19-00460 (2.1.)
in the Deccan Trap Country of Sangli District,		INTAKES
Maharashtra,	INFECTIOUS BOVINE RHINOTRACHEITIS	Air Entrainment in Radial Flow Towards In
W79-00107 4B	VIRUS Membrane Concentration of Infectious Bovine	takes, MMESGOLIFASS
INDIAN WELLS VALLEY	Rhinotracheitis Virus from Water,	W79-00315 - 11 Janua / Turnel Lucius / 18
Ground-Water Data, 1974-76, Indian Wells Val-	W79-00148 5C	Vortex Formation at Vertical Pipe Intakes,
ley, Kern, Inyo, and San Bernardino Counties,	P 7 7 7 7 5 9	W79-00485
California,	INFECTIOUS BOVINEE RHINOTRACHEITIS	
W79-00253	B. R. /Hanson ;I. A. /Schipper W79-00150 5C	INTER-AGENCY COOPERATION
INDIANA	W79-00150 SC	Remote Monitoring of Coal Strip Mine Reha
A Soil Moisture Budget Model Accounting for	INFILTRATION - Search and In the search and Inc.	bilitation, W79-00226
Shallow Water Table Influences,	Steady Infiltration from Single and Periodic	W79-00226
W79-00473 2G	Strip Sources,	INTERNAL WAVES
INDUSTRIAL CHEMICALS	W79-00471 2G	Internal Fronts in Two-Layer Flo,
Assessment of the Environmental Impacts on	Solute Transport During Absorption of Water	W79-00486
the Ban on Imports of PCBs,	by Soil: Laboratory Studies and their Practical	SOURCE AND ADDRESS OF THE STATE OF STATE OF
W79-00290 5G	Implications,	INTERNATIONAL AGENCIES
INDUSTRIAL WASTE	W79-00472 2G	An Analysis of Criticisms of Internation
INDUSTRIAL WASTE Oxygen Activated Sludge Considerations for	INFILTRATION RATES	Fishery Organizations with Reference to Three Agencies Associated with the Canadian We
Industrial Applications,	INFILTRATION RATES Control of Furrow Infiltration by Compaction.	Coast Fishery,
W79.00354 SD	W79.00481	W79_00394

A. Mary	INVERTEBRATES Artificial Substrate Sampler for Benthic Inver-	Water Harvesting for Afforestation: II. Sur-	Flow Reducing Devices Particularly Useful as
ter Quality	tebrates in Ponds, Small Lakes, and Reser-	vival and Growth of Trees, W79-00475 3B	Drip Emitters for Drip Irrigation, W79-00031 3F
SACHOLA SG	voirs, W79-00074 7B	IRON Water Treatment: Iron, Boiler Water and	Two-Step Roll Ahead Irrigation System, W79-00032
ivatives on	Diversity and Environments of Benthic Inver-	Water Analysis.	good the land and A was all to me we troot
orming Ac-	tebrate Communities in South Swedish Streams,	W/9-001/6	Drip Irrigation System, W79-00038
5D	W79-00209	IRON OXIDES Hydrolysis of Iron from Acidic Liquors,	Irrigation Efficiency, A Bibliography, Volume
ZWADO (to -)	Phytophilous Fauna in Ponds Fertilized with	W79-00228 5D	3. PRIAMA YARMINGAN
The Particular	Sugar Factory Wastes, W79-00217 SC	IRON REMOVAL	W79-00307
8B	W79-00217 5C	Hydrolysis of Iron from Acidic Liquors,	IRRIGATION PRACTICES
W73-1000ED	INVESTMENT TO THE PROPERTY OF THE PROPERTY OF	W79-00228 5D	Flow Reducing Devices Particularly Useful as
Evaluation	Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and	IRRADIATION	Drip Emitters for Drip Irrigation, W79-00031
16 189 A 8B	Physical Features.	Degradation of Aqueous Phenol Solution by	metantic militari d'esta-book (o) relai quel
PS100828	W79-00193	Gamma Irradiation, W79-00153	IRRIGATION PROGRAMS
Larvae,	INYO COUNTY	W79-00153	Water and Land Resource Accomplishments 1975. Summary Report.
ovi dut 4A	Ground-Water Data, 1974-76, Indian Wells Val-	The Radiation-Induced Degradation of Lignin	W79-00191 3F
tream Under	ley, Kern, Inyo, and San Bernardino Counties,	in Aqueous Solutions, W79-00164 5D	mer disposed, control will not be cold, public of
ottom Fauna	California, W79-00253	Westernam of the new contraction of the new c	Water and Land Resource Accomplishments 1975, Statistical Appendix I.
High Tatra	W79-00253 7C	IRRIGABLE LAND	W79-00192 3F
5C	ION EXCHANGE	Water and Land Resource Accomplishments 1975. Summary Report.	Water and I and Barrers Annual Columns
WYY-occurs:	Increased Product Water Recovery by Reverse	W79-00191	Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and
in Pulping	Osmosis Using Interstage Ion Exchange Soft- ing and a Spiractor,	DANGE THE COLD COMMENT CONTRACTOR	Physical Features.
ctive Against us Shiraki, in	W79-00301	IRRIGATED SOILS Irrigated Soils of the Milskaya Plain (In Rus-	W79-00193 3F
es,	Vice Laglangting Salurer The Marine In the	sian), A - Interespent M. Sons (or the C.) level and all	Water and Land Resource Accomplishments
5D	Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,	W79-00060 2G	1975, Statistical Appendix IIIProject Data.
Sergon -	W79-00353 5D	IRRIGATION	W79-00194 3F
Rainfall Mea-	Studies of Ion Exchange and Chelation Com-	Angularity Sensor Means for Center Pivot Ir-	IRRIGATION SYSTEMS
Superior Superior	pounds Adsorbed on Granular Graphite,	rigation System, W79-00023	Angularity Sensor Means for Center Pivot Ir-
2B	W79-00431 5D	W79-00023	rigation System, W79-00023
Teflon in Situ	Evaluation of Donnan Dialysis for the En-	Flow Reducing Devices Particularly Useful as	W79-00023
nations,	richment of Cations,	Drip Emitters for Drip Irrigation, W79-00031	Two-Step Roll Ahead Irrigation System,
SYNTAN SA	W79-00434 5A	TANKAR PLOW MOULE	W79-00032
fices,	ION EXCHANGE RESINS	Two-Step Roll Ahead Irrigation System, W79-00032 3F	Drip Irrigation System,
3F	Preliminary Study of Selected Potential En-	W79-00032 3F	W79-00038 3F
r Philadelphia	vironmental Contaminants - Optical	Drip Irrigation System,	Aboveground Sprinkling Device for Sprinkling
enerating Sta-	Brighteners, Methyl Chloroform, Tri-	W79-00038	System,
m,	Chloroethylene, Tetrachloroethylene and ion Exchange Resins,	Aboveground Sprinkling Device for Sprinkling	W79-00059
3 Dyna to SD	W79-00283 5A	System,	ISOTOPE STUDIES
nd Recording	ION FLOTATION	W79-00059 3F	The Isotope Hydrology of the Mereenie Sand-
MARKET REPORTS	Removal of Fluoborate from Plating Waste-	Correlation Between the Salt Content in the	stone Aquifer, Alice Springs, Northern Territo-
7B	water: Technique and Mecahnism,	Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irriga-	ry, Australia, W79-00322 2F
Water and St	W79-00378 5D	tion, (In Russian),	- Proportion of the Control of the C
w Towards In-	IONIZATION	W79-00203 2G	JAMAICA Flood Regions in Jamaica,
Going V = 8B	Factors Influencing Induced Air Flotation,	Shunt Meters with Segmental Orifices,	W79-00330 2E
Hat simmered	W79-00375 5D	W79-00335 3F	TO THE PARTY OF TH
e Intakes,	IONIZING RADIATION	Survival and Early Growth of Selected Trees	JOHNSTOWN AREA Model of the Flooding Caused by the Failure of
8B	Destruction of Trace Toxic Compounds in	on Waste Water Application Sites,	the Laurel Run Reservoir Dam, July 19-20,
of theustalies	Water and Sludge by Ionizing Radiation, W79-00370 5D	W79-00422 5E	1977, near Johnstown, Pennsylvania,
rip Mine Reha-	Walmanger until Waldering a ver	IRRIGATION DESIGN	W79-00263
5G	IONS	Pipe Sizes from Modified Moody Diagram,	JURISDICTION
111	Ion Selective Electrodes in Water Quality Anal- ysis,	W79-00499	Constraints to Welfare Gains Under Extended
OM DENDAMEN	W79-00223	IRRIGATION EFFECTS	Jurisdiction Fisheries Management: Discussion, W79-00231 6B
lo, 8B	RAN	A Note on Effects of Sewage Effluent Irriga-	
Date State In 1948	Rainfall Frequencies for the Persian Gulf Coast	tion on Specific Gravity and Growth Rate of	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion
16200 at M	of Iran.	White and Red Oaks, W79-00425	(Anderson),
of International	W79-00123 2B		W79-00235 6E
Canadian West	Water Harvesting for Afforestation: I. Efficien-	IRRIGATION EFFICIENCY Angularity Sensor Means for Center Pivot Ir-	Constraints to Welfare Gains Under Extended
offered and off	cy and Life Span of Asphalt Cover,	rigation System,	Jurisdiction Fisheries Management,
6E	W79-00474 3B	W79-00023 3F	W79-00240 6E

KALMAN FILTER

FALMAN FILTER	LAGOONS	Relationship of Rainfall and Lake Groundwater
Stream Temperature Estimation Using Kalman	Study of the Fishes of the Lagoon of Alvarado,	Seepage, W79-00489 5B
Filter, Made Made and	Veracruz, Mexico (In Spanish),	W79-00489 5B
W79-00121 5B	W79-00079 2L	LAND AND WATER CONSERVATION FUND
KARA-KUM CANAL	Leaching Characteristics of Various Heavy	(LWCF)
Overgrowing of the Kara Kum Canal and Some	Metals, Non-Heavy Metals and Anions from	Federal Outdoor Recreation Land Acquisition-
Aftereffects of Introducing the White Amur	Municipal Sewage Sludge Ash,	LWCF.
into Water Bodies, (In Russian),	W79-00459 5B	W79-00095
W79-00207 4A	. 3/79-00004 asigned kidesi	TAND DEVELOPMENT
normal voluments and a first three little statements	LAKE ALICE (FL)	Federal Outdoor Recreation Land Acquisition-
KENTUCKY	Waterhyacinth (Eichhornia Crassipes) Nutrient	LWCF.
Organized Resistance to an Imposed Environ-	Uptake and Metabolism in a North Central	and the state of t
mental Change. A Reservoir in Eastern Ken-	Florida Marsh,	Without 17
tucky, ZIDITDARY VORTADIREI		LAND DRAINAGE
W79-00142 Sharaff Alexander Response w 6B	LAKE ERIE	Environmental Management Strategy for the
Hydraulic Model Investigation of a Two-Way	Numerical Computation of Three-Dimensional	Great Lakes System.
Drop Inlet for Floodwater Retarding Structure	Circulation in Lake Erie: A Comparison of a	W79-00084 111 x2bc qqA Talif tis 2 15G
No. 3, Banklick Creek Watershed, Boone and	Free-Surface Model and a Rigid-Lid Model,	LAND MANAGEMENT
Kenton Counties, Kentucky,	W79-00132	Our Reclamation Future: The Missing Bet on
W79-00341 8B	A ME BY A BOD A BION	Trees,
Tellowth.	LAKE EVAPORATION	W79-00086 and 4 At 11 at 40 aste 4 beau 40
Operating Model for the Green River Basin	A Simple Model for Shallow Lake Evapora-	ley Kem Java, and San Kernanding Counting.
Reservoir System,	tion, W79-00326 2D	Federal Outdoor Recreation Land Acquisition-
W79-00452 4A	W79-00326 2D	LWCF.
12100 FT W	LAKE FAYETTEVILLE (ARK)	W79-00095 6E
KEPONE	The Effects of Heavy Metals on Algae Popula-	Balas/Functions of Federal State and Lead
Identification of Kepone Alteration Products in	tions in a South Central Reservoir,	Roles/Functions of Federal, State and Local Public Agencies.
Soil and Mullet,	W79-00011 5C	W79-00098 6E
W79-00080 5A	Street Factor Name . Alton Mark Daniel	# 72-0026
Alter and Divined of Lossy. Adding-day.	LAKE MANAGEMENT	LAND RECLAMATION
KERN COUNTY	Lake Level Control and Management-A Case	Our Reclamation Future: The Missing Bet on
Ground-Water Data, 1974-76, Indian Wells Val-	Study, ORGO PTV	Trees,
ley, Kern, Inyo, and San Bernardino Counties,	W79-00390 4A	W79-00086 4C
California,	CHRICATION	
W79-00253	LAKE MICHIGAN Is Chrysotile Asbestos Released from	Water and Land Resource Accomplishments
KINETICS	Asbestos-Cement Pipe into Drinking Water.,	1975. Summary Report. W79-00191
Stormwater Modeling,	W79-00013 5A	W79-00191 3F
W79-00381 5B	ar Infanta vinelinatina i securati arrinata di successioni	Water and Land Resource Accomplishments
W/7-00301	A First Order Mass Balance Model for the	1975. Statistical Appendix I.
KISSIMMEE RIVER BASIN (FLA)	Sources Distribution and Fate of PCBs in the	W79-00192
Transport Characteristics of Phosphorus in	Environment,	VA 01171
Channelized and Meandering Streams,	W79-00289 5B	Remote Monitoring of Coal Strip Mine Reha-
W79-00391 5B	The same of the sa	bilitation,
	LAKE OF ZURICH	W79-00226 5G
LABORATORY EQUIPMENT	On the Vertical Distribution and Seasonal	LAND RESOURCES
Simple Venturi Device for Mixing Freshwater	Development of the Density of Dreissena	Land Prices Substantially Underestimate the
and Seawater in an Estuarine Culture System,	Polymorpha Larvae in the Pelagic Zone of the	Value of Environmental Quality,
W79-00071 7B	Lake of Zurich (In German), W79-00280 5F	W79-00244 6C
V 40 LOS 02 10 3 LOS 03 10 10 10 10 10 10 10 10 10 10 10 10 10	W 79-00280	
LABORATORY TESTS	LAKE ONTARIO	LAND SUBSIDENCE
Scour of Bed Material in Very Rough Chan-	Generation and Propagation of Downwelling	Use of Dummy Variables in Water Resources
nels,	Fronts,	Studies,
W79-00122 2J	W79-00128 2H	W79-00114 2G
Measurements of Bed Load in Oscillatory	PROPERTY OF A PARTY NAMED AND ASSOCIATION OF THE PARTY NAMED AND ADDRESS OF THE PARTY NAMED A	Maps Showing Water-Level Declines, Land
Flow.	LAKE SUPERIOR	Subsidence, and Earth Fissures in South-Cen-
W79-00141 2J	Lake Superior Regulation Effects,	tral Arizona,
PARIS WALLS LALLEY	W79-00388 4C	W79-00251 7C
Automated Determination of Selenium in	LAKE WASHINGTON (WA)	LAND USE
Water,	Seasonal Changes in Respiratory Enzyme Ac-	
W79-00261 5A	tivity and Productivity in Lake Washington	Soil, Water and Air Sciences Research.
1992, near Johnsonway, Young tongood 220 ft. in	Microplankton,	W79-00105 2G
A Comparison of Ceramic and Teflon in Situ	W79-00212	The Application of Linear Programming to
Samplers for Pore Water Determinations,	TOTAL TOTAL STATE OF THE STATE	Run-Off Management,
W79-00325 5A	LAKE WATER CHEMISTRY	W79-00393
Hydraulic Model Investigation of a Two-Way	Arcadia Lake Water-Quality Evaluation,	
Drop Inlet for Floodwater Retarding Structure	W79-00463	LAND-USE MODEL
No. 3, Banklick Creek Watershed, Boone and	A Marin on Chinese of the Assess Commission of the	A Model for Evaluating the Effect of Land
Kenton Counties, Kentucky,	Chemistry of Small Norwegian Lakes, with	Uses on Flood Flows,
W79-00341 8B	Special Reference to Acid Precipitation,	W79-00450
MAndeyroat),	W79-00321 SA	LANDFILLS
LAGOON OF ALVARADO (MEX)	36	Leaching Characteristics of Various Heavy
Study of the Fishes of the Lagoon of Alvarado,	A Simple Model for Shallow Lake Evapora-	Metals, Non-Heavy Metals and Anions from
Veracruz, Mexico (In Spanish),	A POST SHOULD STOKED IN COST PARTITION TANKED OF THE SHOULD NAME.	Municipal Sewage Sludge Ash,
W79-00079 21.	W79-00326 2D	W79-00459 5B

			MANGANESE
roundwater	LANDSAT AND THE PROPERTY AND THE PARTY OF TH	Looking at the Positive Side of Energy Regula-	LOCAL GOVERNMENT
5B	Applications of Remote Sensing to Hydrologic Planning.	tion, W79-00411 3E	Roles/Functions of Federal, State and Local
N FUND	W79-00099 7B	VFW at 250 page series. You matriar Draws. Alternatival	Public Agencies. W79-00098
\$4000 DOM	LANDSAT I IMAGERY	Development of a Manometric Fish Bioassay	LOTIC ENVIRONMENT
Acquisition-	Determination of Terrestrial Albedo from	Technique for Water Pollution,	Diversity and Environments of Benthic Inver-
6E	LANDSAT I Satellite Imagery in Photographic Form,	W79-00008 master and sol to mediate SA	tebrate Communities in South Swedish
\$679-0020V	W79-00012 7B	LIABILITY . DANG MANY	Streams, W79-00209 5C
Acquisition-	LARVAE	Property Rules, Liability Rules, and Environ- mental Economics,	LOUISIANA
6E	Effect of Environmental Factors on the Dis- tribution of Caddis Fly Larvae in Small Rivers	W79-00241 6E	Inertial Currents Over the Inner Shelf Near 30
T1700-64.85	(In Russian),	LIGNINS	Degree N, W79-00133 2L
tegy for the	W79-00147	The Radiation-Induced Degradation of Lignin	Standard of Party to Copyright Review 1970.
5G	Control of Aquatic Weed by Moth Larvae,	in Aqueous Solutions, W79-00164 5D	Low-Flow Characteristics of Oklahoma
Faynisel Fee	W79-00197	representativities for residence for the second	Streams,
ssing Bet on	LARVAL GROWTH STAGES	Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the	W79-00257
100000 OTTO	Collection Bucket for Use with Tow Nets for Larval Fish,	Preparation of Complex Fertilizers (Primenenie	Low-Flow Characteristics of Streams on the
ate W - base 4C	W79-00070 7B	gidroliznogo lignina dlya ochistki stochnykh	Olympic Peninsula, Washington, W79-00258
Acquisition-	LATERITES AND REAL SAME AND INTERNATIONAL TRAINS	vod ammiachnogo proizvodstva i polucheniya slozhnykh udobrenii),	Takes Services
6E	Rural Water Supplies from Laterite Runoff,	W79-00402 5D	LUMBERING Grazing and Logging Effects on Soil Surface
MRCHRONE	W79-00387	LIMITING FACTORS	Changes in Central Colorado's Ponderosa Pine
te and Local	Model of the Flooding Caused by the Failure of	Effects of N:P Atomic Ratios and Nitrate	Type, W79-00140 40
6E	the Laurel Run Reservoir Dam, July 19-20,	Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,	Village Control of the State of
TOLOO ETW	1977, near Johnstown, Pennsylvania, W79-00263	W79-00211	Changes in Water Regime of Brown Fores Soils of the Georgian SSR Under the Effect of
issing Bet on	Witness Commence Theory	Morphometric Changes in Asterionella For-	Silvicultural Practices, (In Russian),
V at elaborate	A Socio-Economic Approach to Water Pollu-	mosa Colonies Under Phosphate and Silicate	W79-00401 40
1870-00353	tion Law Enforcement in England and Wales,	Limitation, W79-00215 5C	LYSIMETER STUDIES
omplishments	W79-00245 15514 1 160 2 2011 1516 156 -5G	Continuous Culture of Marine Diatoms Under	Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from
3F	LEACHATE	Silicon Limitation. 3. A Model of Si-Limited	Municipal Sewage Sludge Ash,
complishments	Adsorption of Some Toxic Substances by Waste Components,	Diatom Growth,	W79-00459
Sternendar	W79-00152 5B	W79-00229 5C	LYSIMETRY
P65500-0034	Sampling and Modeling of Non-Point Sources	LINEAR FLOW MODEL Water/Energy Management and Evaluation	A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),
p Mine Reha-	at a Coal-Fired Utility,	Model for Pennsylvania,	W79-00284 20
5G	W79-00279 5B	W79-00007 (613) graph as and similar square 6D	MACROPHYTES
later our or the	LEACHATES	A Mathematical Model for Simulating Water	An Investigation of Primary Production and
erestimate the	Sorption Capabilities of Various Materials for Leachate Treatment,	Demand-Supply and Energy Uses for the State of Pennsylvania,	Ecosystem Metabolism in a Lake Michigan Dune Pond,
6C	W79-00377 5D	W79-00442 8A	W79-00205 50
120000	LEACHING CONTRACTOR AND ADDRESS OF THE PARTY	LINEAR PROGRAMMING	MAGNESIUM
ater Resources	A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),	The Application of Linear Programming to	Flame-Photometric Method for the Determina
2G	W79-00284	Run-Off Management, W79-00393	tion of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method
35 LOO 45 20	Leaching Characteristics of Various Heavy	fathers and following found of the other property of	opredeleniya magniya v shchelokakh sul'fitno
eclines, Land in South-Cen-	Metals, Non-Heavy Metals and Anions from	LININGS Seepage Control by Particle Size Selection,	tsellyuloznogo proizvodstva), W79-00415
SUPPLY THOUSAND	Municipal Sewage Sludge Ash, W79-00459 5B	W79-00484 4A	has a namidan with the state of
7C	Waterflyneadh (Chimponymaterialpea) (Tulater	LIQUID WASTES	MAINTENANCE COSTS Water and Land Resource Accomplishments
MAN DISTRIBUTE	LEACHING CHARACTERISTICS Leaching Characteristics of Various Heavy	Transpiration and Evaporation of Sewage Ef-	1975, Statistical Appendix IIIProject Data.
search.	Metals, Non-Heavy Metals and Anions from	fluent, W79-00088 5D	W79-00194 3I
07500-11-W	Municipal Sewage Sludge Ash, W79-00459		MANAGEMENT
rogramming to	LEAD	Treatment of Liquid Wastes from Fossil Fuel Power Plants,	Management Plan for Control and Treatment of Toxic Substances,
Andrew 4A	Environmental Effects of Schuylkill Oil Spill	W79-00355 5D	W79-00346 50
W. P. DOCK	II, June 1972. W79-00294	LITTLE PORT WALTER (ALA)	An Analysis of Criticisms of Internationa
Effect of Land	paraway hould	Simple Venturi Device for Mixing Freshwater	Fishery Organizations with Reference to Three
4C	LEGISLATION Roles/Functions of Federal, State and Local	and Seawater in an Estuarine Culture System, W79-00071 7B	Agencies Associated with the Canadian Wes Coast Fishery.
	Public Agencies.		W79-00394 6E
Various Heavy	W79-00098 at at to as M apart 1902 6E	Field Observations of the Moisture Regime of a	MANGANESE
d Anions from	Water Administration in England and Wales	Yellow-Grey Earth (Otokia Silt Loam) in East-	Water Treatment: Iron, Boiler Water and
sqr. o'a. I see 5B	Impacts of Reorganization, W79-00384 6E	ern Otago, W79-00310 2G	Water Analysis . W79-00176
	02	20	

Stanti W79

On to Syst W79

Concentration Environment Concentration Envi

Meti Map Russ W79

METO A To Prec W79

MEXIC Rejo

MEXI Stud Vers W79

MICR Met from W79

Mic W79

MICR Ove Afte into W79

Wet W75

MILS Irrig sian W79

MINE

Fish ty Pho Imp W79

Aqu Aria W7

Hyd Wit Idal W7

MINII Sho W7

MISSI Cha siss W79

AANGROVE SWAMPS The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove	Computing Two-Dimensional Dam-Break Flood Waves, W79-00313	MEMBRANE PROCESSES Uptake of Americum-241 by Algae and Bacteria,
and Salt Marsh Estuary: A Comparative Study, W79-00204 5C	Dynamics and Control of Suspended Solids in a	W79-00067
AAPPING TARMADATECT STOOL	I wo step Activated Studge Flatte,	Membrane Concentration of Infectious Bovin Rhinotracheitis Virus from Water,
Remote Monitoring of Coal Strip Mine Reha-	Application of Ion Exchange/Adsorption	W79-00148
bilitation, W79-00226 5G	Models to Virus Transport in Percolating Beds,	Laboratory Studies on Advanced Composite I
Methodical Problems in the Evaluation and	W79-00353	F Modules for Seawater Reverse Osmosis, W79-00300
Mapping of Erosion-Endangered Lands (In	Modelling the Water Quality of the Hydrologi-	LINCON OR MANAGE TO A STATE OF THE PARTY OF
Russian), W79-00462	cal Cycle. W79-00379 5B	Increased Product Water Recovery by Revers Osmosis Using Interstage Ion Exchange Soft
(APS	Lake Superior Regulation Effects,	ing and a Spiractor, W79-00301
Groundwater Quality Atlas of Nebraska, W79-00252 7C	W79-00388	Final Report on Field Test Evaluation an
Day last her Positive to Regarding Spington	Transport Characteristics of Phosphorus in	Operation and Maintenance of Seawate
Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Manage-	Channelized and Meandering Streams, W79-00391	Reverse Osmosis and Electrodialysis Pike Plants at Wrightsville Beach Test Facility
ment District and Vicinity, Florida, September, 1977,	Arcadia Lake Water-Quality Evaluation,	November 1976, W79-00302
W79-00275 7C	W79-00463	
MARINE MICROORGANISMS Studies in Microbial Chemotactic Behavior in	Strip Sources,	W79-00303
Seawater, W79-00293 5C	W79-00471 2G	Development of Low Cost Membrane Cleanin Agents,
THE REST OF THE RE	Simple Model for Ocean Outfall Plumes, W79-00479 5B	W79-00304
MARSHES Waterhyacinth (Eichhornia Crassipes) Nutrient	0.842 (1.24 to 1.24 to	Molecular Fractionation by Staged Ultrafiltre
Uptake and Metabolism in a North Central Florida Marsh,	Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged	tion, W79-00367
W79-00206 5C	Catchments: A Case Study from the Papua New Guinea Highlands,	MEMBRANES of descript Simulated of the
MASS TRANSFER	19/20 00401	Electric Resistance of the Cation-Selective
Transfer of Gases at Natural Air-Water Interfaces,	Climate Change: Detection and Its Impact on	MK-40 Membrane During Electrodialysis
W79-00127 2L	Hydrologic Design, W79-00492 2E	Spend Sulfite Liquor (Elektrosoprotivlenie k tionoselektivnoy membrany MK-40 pri ele
MATERIALS Water Relations of Fritted Clays,	Free-Surface Seepage Problem,	trodialze otrabotannogo sul'fitnogo shcheloka W79-00417
W79-00476 2G	W79-00496	MERCURY
MATHEMATICAL MODELS	MAYPLIES	The Source of American Falls Reservoir Poll
WASOPT Users Manual: An Integer Pro- gramming Methodology for Municipal/Regional	Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemou- ra Cinerea (Plecoptera),	tants, W79-00004
Water Supply Planning, W79-00002 6A	W79-00076 SG	Process for Removing Mercury and Mercu
The state of the s	MEADOWS	Salts from Liquid Effluents, W79-00056
On the Two-Dimensional Groundwater Move- ment,	Wet Meadows in Southern Sweden: Vegeta-	W. Marie P. Tarrella Mariana
W79-00108 2F	tion, Succession and Management (In Swedish),	Multimedia LevelsMercury, W79-00291
Comparison of Finite-Element and Finite-Dif-	W79-00288 2I	METABOLISM
ference Schemes. Part I: One-Dimensional Gravity Wave Motion,	MEANDERING STREAMS	An Investigation of Primary Production a
W79-00129 2L	Transport Characteristics of Phosphorus in Channelized and Meandering Streams,	Ecosystem Metabolism in a Lake Michig Dune Pond,
Comparison of Finite-Element and Finite-Dif-	W79-00391 5B	W79-00205
ference Schemes. Part II: Two-Dimensional Gravity Wave Motion,	MEASUREMENT A Novel Method of Estimating the Discharge	Waterhyacinth (Eichhornia Crassipes) Nutrie Uptake and Metabolism in a North Cent
W79-00130 2L	of Water from Mound Springs of the Great Ar-	Florida Marsh,
Kriging in the Hydrosciences, W79-00134 2F	tesian Basin, Central Australia, W79-00112 2F	W79-00206 Photosynthesis and Carbon Metabolism
Model of the Flooding Caused by the Failure of	Hailstone Size inferred from Dents in Cold-	Marine and Freshwater Diatoms,
the Laurel Run Reservoir Dam, July 19-20,	Rolled Aluminum Sheet, W79-00139 7B	W79-00208
1977, near Johnstown, Pennsylvania, W79-00263 2E		METHOD OF CHARACTERISTICS
Sampling and Modeling of Non-Point Sources	MEKONG DELTA Hydrogeologic Reconnaissance of the Mekong	Computing Two-Dimensional Dam-Bre
at a Coal-Fired Utility,	Delta in South Vietnam and Cambodia.	W79-00313
W79-00279 5B	W79-00255 7C	METHODOLOGY
A First Order Mass Balance Model for the	MEMBRANE ADSORPTION PROCEDURE Membrane Concentration of Infectious Bovine	WASOPT Users Manual: An Integer Programming Methodology for Municipal/Region
Sources Distribution and Fate of PCBs in the		
Sources Distribution and Fate of PCBs in the Environment, W79-00289 5B	Rhinotracheitis Virus from Water,	Water Supply Planning, W79-00002

nd Bac-5B Bovine SC posite H sis, 3A

Reverse ge Soft-

tion and Seawater is Pilot Facility,

100-FT3A VI, Cleaning 3A ltrafiltra-5D

Selective alysis of rlenie ka-pri elek-cheloka),

oir Pollu-5B Mercury 5D 5B

ction and Michigan

Nutrient h Central

oolism in 5C

am-Break TAL BA

eger Pro-l/Regional 6A

	SUBJECT INDEX	
MUNICIPAL WATER	MOODY SESSITANCE DIAGRAM	MODEL STUDIES
		278
Stamina Tunnel Tests on Hatchery-Reared At- tantic Salmon,	MISSOURI RIVER Yellowstone National Park Survey May-August	Modeling for Organizational Decision-Making:
W79-00075	1970, Includes Soda Butte Survey, May-Oc-	Profits vs. Social Values in Resource Manage- ment.
HETO CLOSE, THE	4-b 1000	ment, W79-00243 6A
On the Environmental Efficiency of Economic	W79-00250	PAY ADDITION TO A TO
Systems,		Model of the Flooding Caused by the Failure of
W79-00230 6G	MIXING Mixing in an Arctic Fjord,	the Laurel Run Reservoir Dam, July 19-20,
Conceptual and Statistical Issues in Developing	W79-00487	1977, near Johnstown, Pennsylvania,
Environmental Measures - Recent U.S. Ex-	Total and adjust will be to the	W79-00263 2E
perience,	MIXING ZONES	A Simple Model for Shallow Lake Evapora-
W79-00232 6G	The Effect of Reduced Wetlands and Storage	tion, YELDHARAVA REGISTEDA
Control of the Control of Control of the Control of	Basins on the Size, Stability and Productivity	W79-00326 2D
Methodical Problems in the Evaluation and	of the Watershed Mixing Zone, W79-00441	Simulation of Flows in Ungaged Basins,
Mapping of Erosion-Endangered Lands (In Russian),	W79-00441	W79-00331 2E
W79-00462	MODEL STUDIES	SUBJECT VERSE STREET
twining of a comment of the comment of	Nutrient Loading/Lake Trophic Condition	Mass Balance Model for Calculation of Ionic
METOROLOGY COMMENTS OF THE PROPERTY OF THE PRO	Relationships with Special Reference to the In-	Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
A Technique for Estimating Clock Two-Hourly	fluence of Flushing Rate, W79-00001 5C	W79-00332 5B
Precipitation Rate Distributions, W79-00089 2B	W79-00001	The littlest of Maphibours on Novika and An
W /7-00089 2B	Water/Energy Management and Evaluation	Modeling and Monitoring of Toxic Spills and
MEXICAN WATER TREATY	Model for Pennsylvania,	Toxic Effluents,
Reject Stream Replacement Study.	W79-00007	W79-00343 5B
W79-00092 State bogo and do 10 3A	On the Two-Dimensional Groundwater Move-	Dynamics and Control of Suspended Solids in a
Applicate Respective Anticky, of Genominal	ment.	Two-Step Activated Sludge Plant,
MEXICO	W79-00108 2F	W79-00352 5D
Study of the Fishes of the Lagoon of Alvarado, Veracruz, Mexico (In Spanish).	Medicana Streams	Grand Madella and Branchook and become
	Digital Model Studies of Unsteady-State Radial	Stormwater Modeling, W79-00381 5B
W79-00079 2L	Flow to Partially Penetrating Wells in Uncon- fined Anisotropic Aquifers,	17-00361
MICROBIAL DEGRADATION	W79-00111 2F	Optimal Solution to the Timing, Sequencing,
Method for Depolluting Fresh and Sea Water	THE WAS TO SEE THE PARTY OF THE	and Sizing of Multiple Reservoir Surface Water
from Petroleum Products,	Influence of Strip Mines on Regional Ground-	Supply Facilities When Demand Depends on
W79-00058 5G	Water Flow,	Price, W79-00438
Microbial Degradation of DDT,	W79-00118	vertices at hygest and materials and generaline
W79-00278 5C	Stream Temperature Estimation Using Kalman	A Model for Evaluating the Effect of Land
SATURAL RESOURCE ECONOMICS	Filter,	Uses on Flood Flows,
MICROCYSTIS AERUGINOSA	W79-00121 5B	W79-00450 4C
Overgrowing of the Kara Kum Canal and Some	Transfer of Gases at Natural Air-Water Inter-	Using Ice as Water-Impermeable Element in
Aftereffects of Introducing the White Amur	faces,	Rockfill Dams.
into Water Bodies, (In Russian), W79-00207		W79-00466 8D
AA Drait Water and Air Schinger Resourch,		
MILITARY RESERVATIONS	Generation and Propagation of Downwelling	Simulation of Cold Cloud Precipitation in a
Wetlands as a Naval Environmental Concern,	Fronts, W79-00128	Three Dimensional Mesoscale Model, W79-00468 2B
W79-00201 6G	eletion has allowed and in an array of landing	Chronocone Blynkin in Laber Receiving
Company of the Compan	Comparison of Finite-Element and Finite-Dif-	A Soil Moisture Budget Model Accounting for
MILSKAYA PLAIN (USSK)	ference Schemes. Part I: One-Dimensional	Shallow Water Table Influences,
Irrigated Soils of the Milskaya Plain (In Rus-	Otherty water medical,	W79-00473 2G
sian), W79-00060 2G	W79-00129 2L	River Temperature Variation with Freezing and
20	Comparison of Finite-Element and Finite-Dif-	A SHARE CHARLES AND ADDRESS OF THE STATE OF
MINE WASTES	ference Schemes. Part II: Two-Dimensional	Storage, W79-00477
Fish and Wildlife Inventory of the Seven-Coun-		
ty Region Included in the Central Florida		Total Phosphorus Transport During Storm Events.
Phosphate Industry Area-Wide Environmental	On Geostrophic Adjustment in Sea Straits and	Events, W79-00478 5B
Impact Study. Volumes I and II,	Wide Estuaries Part I. One I aver System	38
W79-00100 5C	W79-00131 2L	Control of Water Residence Time in Small
Aquatic Inhabitants of a Mine Waste Stream in	The state of the s	Reservoirs,
Arizona,	Numerical Computation of Three-Dimensional	W79-00482 4A
W79-00426	Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model.	Vortex Formation at Vertical Pipe Intakes,
Hydrochemical Influences on the Fishery	11170 00170	W79-00485 8B
Within the Phosphate Mining Area of Eastern		
AND THE RESERVE THE PROPERTY OF THE PROPERTY O	Kriging in the Hydrosciences,	Potential and Limitations of Rainfall-Runoff
W79-00427 5C	W79-00134 2F	Models for Prediction on Ungauged Catchments: A Case Study from the Papua
		New Guines Highlands
MINIMAL SPANNING TREE	tion of Two-Phase Flow Through Porous	W79_00491
Shortest Path Problems in Hydrogeology,	Media,	
W79-00137	W79-00135 2F	Climate Change: Detection and Its Impact or
MISSISSIPPI	Continuous Culture of Marine Diatoms Under	Hydrologic Design, W79-00492
Changes in Interstitial Water Salinity of a Mis-		W79-00492
sissippi Tidal Marsh,	Diatom Growth,	Continuous Simulation of Nonpoint Pollution,
W79-00338 2L		W79-00493 SE

5C

2L

5B

MODEL STUDIES

Free-Surface Seepage Problem,	MOODY RESISTANCE DIAGRAM	MUNICIPAL WATER
W79-00496	Pipe Sizes from Modified Moody Diagram, W79-00499	Water and Land Resource Accomplishments 1975, Statistical Appendix II-Finances and
On Geostrophic Adjustment in Sea Straits and	W79-00499 Street Free Is not all a more 3F	Physical Features.
Wide Estuaries: Theory and Laboratory Ex- periments. Part II - Two-Layer System,	Acute and Chronic Oral Toxicity of Chl-	W79-00193
W79-00497 2L	roinated Dibenzofurans to Salmonid Fishes,	Resource Analysis: Water and Energy as
MOISTURE forment and levint aft	W79-00062	Linked Resources, W79-00453
Growth Aspects of Green Ash Seedlings in	The Effect of Naphthalene on Survival and Ac-	Allowers Shriften on Advance Compacts of
Years Varying in Moisture (In Russian), W79-00018	tivity of the Amphipod Parhyale, W79-00081	MUSSELS On the Vertical Distribution and Seasonal
W79-00018 2I MOISTURE AVAILABILITY	W79-00081 MOUND SPRINGS	Development of the Density of Dreissena
Water Relations and Physiological Activity of	A Novel Method of Estimating the Discharge	Polymorpha Larvae in the Pelagic Zone of the Lake of Zurich (In German),
Potatoes, W79-00017	of Water from Mound Springs of the Great Ar-	W79-00280 SF
W79-00017	tesian Basin, Central Australia, W79-00112	MUTAGENS
MOISTURE BLOCKS Field Observations of the Moisture Regime of a	W79-00112 2F	Preliminary Study of Selected Potential En-
Yellow-Grey Earth (Otokia Silt Loam) in East-	Longitudinal Dispersion of Fluid Particles in	vironmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-
ern Otago,	Mountain Streams: I. Theory and Field	Chloroethylene. Tetrachloroethylene and ion
W79-00310 2G	Evidence, W79-00308 5B	Exchange Resins, W79-00283 5A
MOISTURE DEFICIT	Thursday has acted at har Established	
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of	Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean	NAPHTHALENES The Effect of Naphthalene on Survival and Ac-
Silvicultural Practices, (In Russian),	Motion and Its Application,	tivity of the Amphipod Parhyale,
W79-00401	W79-00309 5B	W79-00081 5C
MOISTURE STRESS	Origin and Transport of Large Boulders in	NATIONAL PARKS
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,	Mountain Streams, W79-00490	Water Quality in the Ozark National Scenic Riverways, Missouri,
W79-00016 21	Constitution of the second of the second of the second	W79-00254 5B
Water Relations and Physiological Activity of	MULLETS Identification of Kepone Alteration Products in	NATIONAL WATER COMMISSION
Potatoes,	Soil and Mullet,	The National Water Commission Revisited Per-
W79-00017	W79-00080 22 4 00 Set 14 101 1 201 5A	spective on National Water Policy Studies,
MOLECULAR FRACTIONATION	MULTIMEDIA DEEP BED FILTRATION	with some Implications for Changes in Future Water Policy,
Molecular Fractionation by Staged Ultrafiltra- tion,	(MMDB) New Developments in Oil Interception by Fil-	W79-00383 6E
W79-00367	tention	NATURAL RESOURCE ECONOMICS
MOLECULAR WEIGHT	W79-00364 5D	Natural Resource Economics: The Upsetting
Investigations of the Molecular Weight, Free	MULTIPLE PURPOSE	Discipline, W79-00242
Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid,	Modeling for Organizational Decision-Making:	
W79-00436 1B	Profits vs. Social Values in Resource Manage- ment,	NATURAL RESOURCES Soil, Water and Air Sciences Research.
MOLLUSKS	W79-00243 6A	W79-00105
Ecology of Dreissena Polymorpha (Pall.)	MULTIPLE-PURPOSE RESERVOIRS	NATURAL STREAMS
(Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,	Optimal Operation of Shelbyville and Carlyle	Momentum Transfer in a Compound Channel,
W79-00068 5C	Lakes, W79-00392	W79-00334
MOLTING	Graylor Wave Mouses, (daily at	NEBRASKA
Toxicity of Sodium Pentachlorophenate (NA-	MUNICIPAL SEWAGE SLUDGE INCINERATOR ASH	Groundwater Quality Atlas of Nebraska, W79-00252
PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,	Leaching Characteristics of Various Heavy	Ground-Water Availability in the Hitchcock-
W79-00078 5C	Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,	Red Willow, Frenchman Valley, and Meeker-
MOMENTUM	W79-00459 5B	Driftwood Irrigation Districts, Southwest
Momentum Transfer in a Compound Channel,	MUNICIPAL SEWAGE TREATMENT	Nebraska, W79-00260
W79-00334 8B	Resource Analysis: Water and Energy as	NEUTRALIZATION
MONITORING Aquatic Biotal Monitor,	Linked Resources, W79-00453 6D	Sea-Water Neutralization of Effluents from the
W79-00033 5A	MUNICIPAL WASTE	Industrial Processing of Phosphorite. A Case
Remote Water Monitoring System,	Instrumentation and Controls for Philadelphia	Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,
W79-00047	Electric Company Eddystone Generating Sta-	W79-00151 5G
Automatic System Cleaner for Remote Moni-	tion Wastewater Treatment System, W79-00357	NEW ENGLAND
tor, and an animal of a theory	MUNICIPAL WASTES	The Feasibility of Using Forest Lands for
W79-00051	Characterization of Performance of Full-Scale	Recycling Sludge Nutrients in Northern New England,
Collection Bucket for Use with Tow Nets for	Tertiary Wastewater Granular Media Filters,	England, W79-00446 5E
Larval Fish, W79-00070 7B	W79-00371	NEW HAMPSHIRE
	Leaching Characteristics of Various Heavy	The Feasibility of Using Forest Lands for
Modeling and Monitoring of Toxic Spills and Toxic Effluents,	Metals, Non-Heavy Metals and Anions from Municipal Sewage Sludge Ash,	Recycling Sludge Nutrients in Northern New England,
W79-00343 5B	W79-00459 5B	W79-00446
29000-05	36 00000 85 M	E) BE(00-0538

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est Lands for Northern New

becoming authors on Japansdy, con Smularer	MOTA ABILIONAL MAIN	The same of the sa
NEW ZEALAND Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in East-	NORTH CAROLINA Nature and Impact of Rural Stream Inputs on Water Quality,	OGALLAL FORMATION Ground-Water Availability in the Hitchcock- Red Willow, Frenchman Valley, and Meeker-
ern Otago, W79-00310	W79-00483	Driftwood Irrigation Districts, Southwest
BC STRIP GALL BY STRIP AND THE TOWNS OF THE BOARD	NUCLEAR WASTES	Nebraska, W79-00260 4B
NEWTS The Toxicity of Manganese Ethylenebisdithic- carbamate to the Adult Newt, Triturus	Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea, W79-00077	OHIO TAMES OF THE PROPERTY OF THE PERSON OF
Cristatus,	W79-00077 5B NUMERICAL ANALYSIS	Determination of Spoil-Bank Erosion Rates in Ohio by Using Interbank Sediment Accumula-
NICKEL	Numerical Study of Continuous Saltation,	tions, W79-00495
Controls Drive Platers to Materials Recovery,	W79-00314	OHIO RIVER BASIN
W79-00154 5D	NUTRIENT CYCLING Influence of Nitrogen Fertilization on the	Water Resources Data for Pennsylvania, Water
NIGERIA Rural Water Supplies from Laterite Runoff, W79-00387 5F	Quality and Quantity of Streamflow from a Forested Watershed, W79-00448	Year 1977Volume 3. Ohio River and St. Lawrence River Basins. W79-00268 7C
NITRATE NITROGEN FLUX	NUTRIENT LOADING	OIL of the same of
Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a	Nutrient Loading/Lake Trophic Condition Relationships with Special Reference to the In-	The Effect of Naphthalene on Survival and Activity of the Amphipod Parhyale,
Forested Watershed, W79-00448 5B	fluence of Flushing Rate, W79-00001 5C	W79-00081
NITRATE REDUCTASE	NUTRIENT REMOVAL	Environmental Effects of Schuylkill Oil Spill II. June 1972.
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress,	Waterhyacinth (Eichhornia Crassipes) Nutrient	II, June 1972. W79-00294 5C
W79-00149 2I	Uptake and Metabolism in a North Central Florida Marsh,	OIL INDUSTRY
NITRATES	W79-00206	The Effect of Cyclohexane Derivatives on
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated	NUTRIENT REQUIREMENTS	Selection of Bacterial Groups Forming Ac- tivated Sludge Microflora,
by Gonyaulax Polyedra,	Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water	W79-00159 5D
W79-00210 5C	of the Dagestan ASSR, W79-00320 2H	Controlling and Monitoring Activated-Sludge
Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition.	NUTRIENTS	W79-00160 5D
and Nitrate Uptake, W79-00211	Waterhyacinth (Eichhornia Crassipes) Nutrient Uptake and Metabolism in a North Central	OIL LOLLO LION
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two	Florida Marsh, W79-00206 5C	Method of Disposing of Waste Water Contain- ing Emulsified Oil, W79-00020 5D
Long-Term Nitrogen-Rate Experiments with Corn,	A Lysimetric Study of Waters in an Irrigated	Oil Fence.
W79-00500 2G	Pasture (In Russian), W79-00284 2G	W79-00036 5G
NITRIFICATION	Transport Characteristics of Phosphorus in	Belt Type Oil Removal Unit,
Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling	Channelized and Meandering Streams, W79-00391 5B	W79-00040 5G
Filter, W79-00433	AN CHARLES TO SERVE WELL AND ACCUMENT	Process and Apparatus for Separating Oil From
W79-00433 5D Aerobic Media Trickling Filter Applied to	Arcadia Lake Water-Quality Evaluation, W79-00463 5C	Water Contaminated with Oil, W79-00050
Nitrogen Control,	OAK TREES	Method for Depolluting Fresh and Sea Water
W79-00445 5D	A Note on Effects of Sewage Effluent Irriga- tion on Specific Gravity and Growth Rate of	from Petroleum Products, W79-00058
NITRITES Denitrifying Bacteria Can be Enumerated in	White and Red Oaks,	Manufacture of the second
Nitrite Broth, W79-00498	W79-00425 5E OBSERVATION WELLS	No Water-Source Damage Found in Oil States. W79-00172
NITROGEN	Ground-Water Levels in Wyoming, 1977,	Environmental Effects of Schuylkill Oil Spil
Effects of N:P Atomic Ratios and Nitrate	W79-00259 7C	II, June 1972. W79-00294 50
Limitation on Algal Growth, Cell Composition, and Nitrate Uptake, W79-00211 5C	OCEANS Optical Classification of Natural Waters,	OIL RESERVOIRS
NON-POINT POLLUTION SOURCES	W79-00318 2L	Water Analytical Data as a Tool in Drilling and Production Economics,
The Source of American Falls Reservoir Pollu-	Simple Model for Ocean Outfall Plumes, W79-00479 5B	W79-00168 80
tants, W79-00004	ODOR standed to stopp he was a six of parties.	OIL SPILLS
NONAGRICULTURAL LANDS	Water 1977, W79-00342 5D	Apparatus for Deploying and Taking Up an Oil
Water and Land Resource Accomplishments 1975. Statistical Appendix II-Finances and		W79-00048
Physical Features. W79-00193	Modification Versus Air Treatment,	Oil-Troubled Water,
NONPOINT POLLUTION Continuous Simulation of Nonpoint Pollution,	Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures,	Environmental Effects of Schuylkill Oil Spil II, June 1972.
W79-00493 5B	W79-00374 5D	W79-00294 50

SUBJECT INDEX XX000 TORLEUS

OIL WASTES Oil/Water Separation Technology: The Options Available - Part 2,	OPEN CHANNEL FLOW Three-Dimensional Open Channel Flow, W79-00312 8B	Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud Precipitation.
W79-00158 5G	OPEN CHANNELS	W79-00350 (112 size (O) dread you Day 12 5D
The Effect of Cyclohexane Derivatives on Selection of Bacterial Groups Forming Ac- tivated Sludge Microflora, W79-00159 5D	Three-Dimensional Open Channel Flow, W79-00312 8B	ORTHOPHOSPHATE Transport Characteristics of Phosphorus in Channelized and Meandering Streams, w79.00361
W79-00159 5D	OPERATING COSTS Water and Land Resource Accomplishments	W79-00391 OF THE STATE OF THE S
Controlling and Monitoring Activated-Sludge Units, W79-00160 5D	1975, Statistical Appendix III-Project Data. W79-00194	OUTFALL PLUMES Simple Model for Ocean Outfall Plumes, W79-00479 5B
OILY WASTE New Developments in Oil Interception by Fil-	OPERATING RULES Optimal Operation of Shelbyville and Carlyle Lakes,	OUTFALL SEWERS Simple Model for Ocean Outfall Plumes, W79-00479 5B
tration, W79-00364 5D	W79-00392 this objected to possess 4A	OVERDRAFT
OILY WASTES	OPTICAL BRIGHTENERS	Maps Showing Water-Level Declines, Land
Factors Influencing Induced Air Flotation, W79-00375 5D	Preliminary Study of Selected Potential Environmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-	Subsidence, and Earth Fissures in South-Central Arizona,
OILY WATER and bashed days of he health off	Chloroethylene, Tetrachloroethylene and ion	W79-00251 7C OXIDATION
Removal of Ammonium Sulfide from Waste- water by Liquid Membrane Process,	Exchange Resins, W79-00283 5A	OXIDATION Biological Oxidation and Flotation Apparatus and Method,
W79-00161 5D	OPTICAL PROPERTIES	W79-00030 5D
OKLAHOMA Low-Flow Characteristics of Oklahoma	The Radiation-Induced Degradation of Lignin in Aqueous Solutions,	Pretreatment of Industrial Wastes with Ozone, W79-00368 5D
Streams, W79-00257	W79-00164 5D	HC2624100-644
The Mirel only digitions and their street to	Optical Classification of Natural Waters,	OXYGEN Effects of Feeding and of Chemical Stimulation
High-Flow Frequencies for Selected Streams in Oklahoma,	W79-00318	on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),
W79-00273	OPTIMIZATION Water/Energy Management and Evaluation	W79-00083
OLIGOTRAPHY A Periphytic Microflora Analysis of the	Model for Pennsylvania, W79-00007 6D	Effects of Dissolved Oxygen in the Oxygena-
Colorado River and Major Tributaries in Grand		tion Activated Sludge Process, W79-00351
Canyon and Vicinity, W79-00285	Shortest Path Problems in Hydrogeology, W79-00137 6A	OXYGEN CONSUMPTION (CARP)
OLYMPIC PENINSULA (WASH) Low-Flow Characteristics of Streams on the	The Optimal Pricing of Undepletable Externali- ties.	Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions
Olympic Peninsula, Washington, W79-00258 2E	W79-00239 6C	(In Russian), W79-00180 2H
ON-SITE DATA COLLECTIONS	Modelling the Water Quality of the Hydrologi-	OXYGEN REQUIREMENTS
Field Observations of the Moisture Regime of a Yellow-Grey Earth (Otokia Silt Loam) in East-	cal Cycle. W79-00379 5B	Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemou- ra Cinerea (Plecoptera),
ern Otago,	Optimal Operation of Shelbyville and Carlyle	W79-00076
W79-00310 2G	Lakes, W79-00392 4A	OXYGENATION
ON-SITE INVESTIGATIONS	TAKEN CONTRACTOR OF THE PROPERTY OF THE PROPER	Degradation of Aqueous Phenol Solution by
Aquatic Biotal Monitor, W79-00033 5A	Dynamic Programming and the Principle of Op- timality: A Systematic Approach,	Gamma Irradiation, W79-00153
Quantitative Comparison of Seining and Un-	W79-00396 6A	The UNOX Process: Effective Wastewater
derwater Observation for Stream Fishery Surveys,	OPTIMUM DEVELOPMENT PLANS Optimal Solution to the Timing, Sequencing,	Treatment Practice, W79-00347 5D
W79-00072 7B	and Sizing of Multiple Reservoir Surface Water Supply Facilities When Demand Depends on	Comparison of Complete Mixed Activated
Artificial Substrate Sampler for Benthic Inver- tebrates in Ponds, Small Lakes, and Reser-	Price	Sludge and UNOX Treatment of Brewery Wastes,
voirs, W79-00074 7B	Educat Synkology	W79-00348 HE A AREA THE TO STEEL SD
A Field Evaluation of Subsurface and Surface	ORGANIC LOADING Controlling and Monitoring Activated-Sludge	Effects of Dissolved Oxygen in the Oxygena- tion Activated Sludge Process,
Runoff, II. Runoff Processes, W79-00116 2E	Units, W79-00160 5D	W79-00351 5D
	ORGANIC MATTER	Oxygen Activated Sludge Considerations for
Field Investigation of Selective Withdrawal, W79-00119	Phytoplankton Extracellular Release and Its Relation to the Seasonal Cycle of Dissolved Or-	Industrial Applications, W79-00354 5D
Changes in Interstitial Water Salinity of a Mississippi Tidal Marsh,	W79-00213 5C	Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling
W79-00338 2L	ORGANIC WASTES	Filter,
ON-SITE LABORATORIES	What's in the Water, A Look at the Proposed	W79-00433

What's in the Water, A Look at the Proposed EPA Regulations for Organic Chemicals in Public Water Supplies, W79-00179

P

P

P

P

P

Aerobic Media Trickling Filter Applied to Nitrogen Control, W79-00445 5D

Ion Selective Electrodes in Water Quality Anal-

Activated			PATH OF POLLUTANTS
Alum-Mud	A Study for Improving the Aerobic-Media	PASTURES .	Color Reserved Reserved
5D	Trickling Filter, W79-00457 5D	A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),	Color Removal Process, W79-00042
PRODUCTION OF THE PROPERTY OF		W79-00284	Battery Operated Water Purification System,
sphorus in	OYSTER PONDS First Ecological Data on the Oyster Ponds in	PATENTS	W79-00043 5F
5B	the Bay of Bourgneuf (In French), W79-00295	Water Filtering and Dispensing Apparatus, W79-00019 5F	Method for Treating Sewage, W79-00044 5D
mes,	OYSTERS First Ecological Data on the Oyster Ponds in	Method of Disposing of Waste Water Containing Emulsified Oil,	Water Distiller with Cone Shaped Condenser, W79-00045 SF
imes,	the Bay of Bourgneuf (In French), W79-00295 2L	W79-00020 5D Ecological System and Method.	Apparatus for Producing High-Purity Water, W79-00046 5F
5B	OZARK NATIONAL SCENIC RIVERWAYS	W79-00021 5G	Remote Water Monitoring System,
NUMBER	Water Quality in the Ozark National Scenic Riverways, Missouri,	Treatment of Solids-Liquid-Gas Mixtures,	W79-00047 7B
lines, Land South-Cen-	W79-00254 5B	W79-00022 5D	Apparatus for Deploying and Taking Up an Oil
- 24 F F ST 15 S	OZONE TRANSMISSENT IN MAT has priority	Angularity Sensor Means for Center Pivot Ir-	Fence, W79-00048
sansolin 7C	Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.	rigation System, W79-00023	of the second se
n Apparatus	W79-00306 5D	Treatment of Effluent,	Process and System for Recovery of Energy from Geothermal Brines and Other Water Con-
REPORT AND THE	Water 1977.	W79-00024 5D	taining Sources by Direct Contact with a Work-
A STATIST	W79-00342 5 D	Skimming Apparatus,	ing Fluid Below the Critical Pressure, W79-00049 4B
with Ozone, 5D	Pretreatment of Industrial Wastes with Ozone,	W79-00025 5G	Process and Apparatus for Separating Oil From.
91/79-00149	W79-00368	Treatment of Lime-Sulfide Tannery Unhairing	Water Contaminated with Oil,
al Stimulation	New Technology: Ozone/UV Chemical Oxida-	Waste, W79-00026	W79-00050 5G
us Reticulatus	tion Wastewater Process for Metal Complexes, Organic Species and Disinfection,		Automatic System Cleaner for Remote Moni- tor,
HENCHOLD VSC	W79-00369 5D	Low Molecular Weight Hydrolyzed Polyacryla- mide Used as a Scale Inhibitor in Water Systems,	W79-00051 5A
the Oxygena-	A Pilot Plant Trial for Ozone Sterilization of Fish Hatchery Water,	W79-00027	Employing Methylene Phosphonates of Oxyal- kylated Polyalkylene Polyamines in Chelation
5D	W79-00455 5G	Carbon Contact Column,	and/or Scale Inhibition,
Service Street	PACIFIC NORTHWEST	W79-00028 5D	W79-00052 5F
tion of Young ing Conditions	The Development of the Electrical Power System in the Pacific Northwest, A Public Pol-	Solid-Fluid Contacting Process, W79-00029 5G	Method for Clarifying Aqueous Waste Liquids Containing Acid Dyes,
man Tomo 2H	icy Perspective, W79-00143	Biological Oxidation and Flotation Apparatus	W79-00053
ComW79400500	Regional Electric Energy Planning: A Case	and Method, W79-00030 SD	Process for the Treatment of Water Solution by Ion Exchange,
to Anoxia in	Study in the Politics of Scarce Resources,	Marghander, Change of Account her	W79-00054 5F
a) and Nemou-	W79-00144 6E	Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,	Activated Sludge System with Staggered Parti-
5G	PAPUA NEW GUINEA Potential and Limitations of Rainfall-Runoff	W79-00031 3F	tion Basin, W79-00055 5D
1 Ladg-6549	Models for Prediction on Ungauged	Two-Step Roll Ahead Irrigation System,	Gesevel manimum kings, 1 of many
ol Solution by	Catchments: A Case Study from the Papua New Guinea Highlands,	W79-00032	Process for Removing Mercury and Mercury Salts from Liquid Effluents,
5D	W79-00491 2A	Aquatic Biotal Monitor,	W79-00056 5D
ve Wastewater	PAPUA NEW GUINEA HIGHLANDS	W79-00033 5A	Desalination Process Using Thermally
5D	Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged	Contaminated with Industrial Waste Seeping	
ixed Activated	Catchments: A Case Study from the Papua New Guinea Highlands,	Through Soil Containing Said Water, W79-00034 5G	Method for Depolluting Fresh and Sea Water
nt of Brewery	W79-00491 2A	The addition of the state of th	from Petroleum Products, W79-00058
M to strain SD	PARAMETRIC HYDROLOGY	Stabilization of Earth Subsurface Layers, W79-00035	TOD STANDARD TO TO THE TOTAL PROPERTY OF THE
in the Oxygena-	Stormwater Modeling,	Oil Fence,	Aboveground Sprinkling Device for Sprinkling System,
SD SD	W79-00381	W79-00036 5G	W79-00059 3F
nsiderations for	PARTIAL PENETRATION Type-Curve Analysis of Time-Drawdown Data	Energy Conversion System,	Process for Purifying Aqueous Industrial Ef-
arest	for Partially Penetrating Wells in Unconfined	W79-00037	fluents. W79-00399 5D
5D	Anisotropic Aquifers, W79-00136 2F	Drip Irrigation System,	
and Nitrifying Media Trickling	CHOT PLANTS OF THE PROPERTY OF		Waterhyacinth (Eichhornia Crassipes) Nutrient
TOP SOMETIC	PARTICLE SIZE Hailstone Size inferred from Dents in Cold-	Treatment of Water or Aqueous Systems,	Uptake and Metabolism in a North Central Florida Marsh,
OZ nejszal Fostor	Rolled Aluminum Sheet,	The state of the s	W79-00206 5C
ilter Applied to	W79-00139 7B	Belt Type Oil Removal Unit, W79-00040	Geology and Ground Water in Door County,
SD SD	PARTICLE TRAJECTORIES Numerical Study of Continuous Saltation,	Clarification Process,	Wisconsin, with Emphasis on Contamination
11,18-110483	W79-00314 8B		Potential in the Silurian Dolomite, W79-00256 5B

A 1 CONTRACTOR OF THE PARTY OF		Decision and Discontract on Chinese Associated
PEA Effect of Sulfur Deficiency on Water Regime	Criteria Documents for Aldrin/Dieldrin. W79-00282	Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthes-
and Intensity of Pea and Wheat Photosynthes- is, (In Russian),	Laboratory Study of the Release of Pesticide	is, (In Russian), W79-00200 21
W79-00200 STATE THAT ARE SOLVE US 21	and PCB Materials to the Wate Column During Dredging and Disposal Operations,	The Photosynthetic and Respiratory Rates and
PEAK DISCHARGE	W79-00286	Tolerances of Benthic Algae from a Mangrove
Analysis of Flood Resulting from the Toccoa	Water Fiftering and Discovering Agencylus	and Salt Marsh Estuary: A Comparative Study,
Falls, Georgia, Dam Break, W79-00262 2E	PESTICIDE TOXICITY Toxicity of the Fungicide Captan to the Dunge-	W79-00204
Water Dichiller web Cone Thegod Conscience."	ness Crab Cancer Magister,	Photosynthesis and Carbon Metabolism in
PENNSYLVANIA Water/Energy Management and Evaluation	W79-00065 An hymidem 3 a 3C	Marine and Freshwater Diatoms, W79-00208
Model for Pennsylvania, and and analysis	Toxicity of Sodium Pentachlorophenate (NA-	W79-00395 ESET ELECTION
W79-00007 6D	PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,	PHOTOSYSTHESIS Stomatal and Nonstomatal Regulation of Water
Data Base System for State Water Quality	W79-00078 5C	Use in Cotton, Corn and Sorghum,
Management Information System. W79-00222 5G	Criteria Document for DDT.	W79-00016 From M av war 21
Appetitive for Replicate and Tall in Care Cit.	W79-00276 SA	PHTHALATES
Water Resources Data for Pennsylvania, Water	Criteria Document for Toxaphene.	Uptake and FAte of DI-2-Ethylhexyl Phthalate
Year 1977Volume 2. Susquehanna and Potomac River Basins.	THE COURT	in Aquatic Organisms and in a Model
W79-00265 7C	W79-00281 and The Anthropolitic Company SA	Ecosystem, Spendo V regargolos E
sing the same and her analysis hereditary most	Criteria Documents for Aldrin/Dieldrin.	W79-00061 5B
Water Resources Data for Pennsylvania, Water	W79-00282	The Toxicity of Phthalates to the Marine
Year 1977Volume 1. Delaware River Basin.	PHENOLS	Dinoflagellate Gymnodinium Breve,
W79-00266	Degradation of Aqueous Phenol Solution by	W79-00063 5C
Water Resources Data for Pennsylvania, Water	Gamma Irradiation,	Professionated industrial Warray will Discour
Year 1977Volume 3. Ohio River and St.	W79-00153 5D	PHYTOPHILOUS FAUNA
Lawrence River Basins.	PHOSOPHO-ARGININE	Phytophilous Fauna in Ponds Fertilized with
W79-00268 7C	The Phosphagens of Some Protozoa as Ecologi-	Sugar Factory Wastes,
BENTA CUI OBBUENOI		W79-00217
PENTACHLORPHENOL Toxicity of Sodium Pentachlorophenate (NA-	cal Indicators (In French), W79-00423	PHYTOPLANKTON
PCP) to the Grass Shrimp, Palaemonetes Pugio,	verteril casi rentiglial colonia un uno ultre il calciforni	Studies on the Pathways and Effects of Cadmi-
at Different Stages of the Molt Cycle,	PHOSPHAGENS	um in Controlled Ecosystem Enclosures,
W79-00078 5C	The Phosphagens of Some Protozoa as Ecologi- cal Indicators (In French),	W79-00066 and F year talk and 5E
DEDCOL LETON	W79-00423	An Investigation of Primary Production and
PERCOLATION Application of Ion Exchange/Adsorption	GR WORLD COOK STW ALL	Ecosystem Metabolism in a Lake Michigar
Models to Virus Transport in Percolating Beds,	PHOSPHATES	Dune Pond,
W79-00353 5D	Fish and Wildlife Inventory of the Seven-Coun-	W79-00205
PERIPHYTON	ty Region Included in the Central Florida Phosphate Industry Area-Wide Environmental	Diel Gustes of Januarie Nitrones Watche in a
A Periphytic Microflora Analysis of the	Impact Study. Volumes I and II,	Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated
Colorado River and Major Tributaries in Grand	W79-00100 5C	by Gonyaulax Polyedra,
Canyon and Vicinity,	Manhamatria Chances in Asteriosella For	W79-00210
W79-00285 5A	Morphometric Changes in Asterionella For- mosa Colonies Under Phosphate and Silicate	
PERMEABILITY	Limitation,	Effects of N:P Atomic Ratios and Nitrate
Removal of Ammonium Sulfide from Waste-	W79-00215 5C	Limitation on Algal Growth, Cell Composition and Nitrate Uptake,
water by Liquid Membrane Process,	W 79-40793	W79-00211
W79-00161 5D	Hydrochemical Influences on the Fishery	A CONTROL OF THE CONTROL OF THE CONTROL AND CONTROL OF THE CONTROL
	Within the Phosphate Mining Area of Eastern Idaho,	Seasonal Changes in Respiratory Enzyme Ac
Allowing for the Water Permeability of Frozen Ground Screens During their Formation,	W79-00427	tivity and Productivity in Lake Washington
W79-00467 8D	W.AA-0000.3L	Microplankton, W79-00212
THE STATE OF THE PARTY OF THE P	PHOSPHORUS	W79-00212
PERSIAN GULF (IRAN)	Nutrient Loading/Lake Trophic Condition	Phytoplankton Extracellular Release and It
Rainfall Frequencies for the Persian Gulf Coast	Relationships with Special Reference to the In- fluence of Flushing Rate,	Relation to the Seasonal Cycle of Dissolved Or
of Iran, W79-00123	W79-00001 5C	ganic Carbon in a Eutrophic Lake,
W19-00123	Seria coldina	W79-00213
PESTICIDE KINETICS	Effects of N:P Atomic Ratios and Nitrate	A Comparison by Size Class and Volume o
Criteria Document for DDT.	Limitation on Algal Growth, Cell Composition,	Detritus Versus Phytoplankton in Chesapeak
W79-00276 5A	and Nitrate Uptake, W79-00211	Ray
Criteria Document for Toxaphene.	athen over	W79-00494
W79-00281 5A	Total Phosphorus Transport During Storm	MOV SI O I N MISSONINI E LONGE E LONGE
18 historial messay apprinted for personal	Events,	PICK-SLOAN MISSOURI BASIN PROGRAM
Criteria Documents for Aldrin/Dieldrin.	W79-00478 5B	Water and Land Resource Accomplishment 1975, Statistical Appendix IIIProject Data.
W79-00282 5A	PHOTOGRAPHY	W79-00194
Manual of Analytical Quality Control for Pesti-	Determination of Terrestrial Albedo from	TE The second of the second of the Second
cides and Related Compounds in Human and	LANDSAT I Satellite Imagery in Photographic	PILOT PLANTS
Environmental Samples,	Form, This of Propagation and Wile Assessant	Increased Product Water Recovery by Revers
W79-00287 5A	W79-00012 7B	Osmosis Using Interstage Ion Exchange Soft
PESTICIDE RESIDUES	PHOTOSYNTHESIS	ing and a Spiractor, W79-00301
Identification of Kepone Alteration Products in	Water Relations and Physiological Activity of	W79-00301
0 4 136 4 .		The second secon

Potatoes, W79-00017 P

PI

Final Report on Field Test Evaluation and Operation and Maintenance of Seawater

Soil and Mullet, W79-00080 5A

			POLYMERS
ter Regime	Reverse Osmosis and Electrodialysis Pilot	PLANT PHYSIOLOGY	Ion Selective Electrodes in Water Quality Anal-
otosynthes- 2I	Plants at Wrightsville Beach Test Facility, November 1976, W79-00302 3A	Atmospheric Water-Vapor Resources for Rain- fall as They are Related to Water Synthesis in	ysis, W79-00223
10 M W W	W79-00302 3A	Plant Life, Annotated Bibliography. W79-00106	PCB in Water, A Bibliography, Volume 3.
Rates and Mangrove	High Temperature Electrodialysis-Phase VI,	PLANT TRANSPIRATION	W79-00305
tive Study,	Econystem Metabolists in a Jake Michigan	Chemical Inhibitors of Plant Transpiration: IV.	Modeling and Monitoring of Toxic Spills and
5C	Development of Low Cost Membrane Cleaning Agents,	Action of Alar-85, (In French), W79-00247	Toxic Effluents, W79-00343
tabolism in	W79-00304	PLASTICS 100 mont are hold to ample wed	Influence of Methodological Factors on Plate
ion of Water	PIPE FLOW Shunt Meters with Segmental Orifices, W79-00335 3F	Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model Ecosystem, W79-00061	Counting of Aquatic Bacteria: I. Statistical Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of Counting, (In Spanish),
O ableW	Pipe Sizes from Modified Moody Diagram, W79-00499	PLAYAS Andreas Island	W79-00385
xyl Phthaiate n a Model	W79-00499 PIPES Characterization of the Release of Chrysotile Asbestos from Asbestos-Cement Drinking	Hydrogeochemistry of a Calcrete-Containing Aquifer Near Lake Way, Western Australia, W79-00323	Flame-Photometric Method for the Determina- tion of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shchelokakh sul fitno-
gangoldist neteo envi 5B	Water Pipe, W79-00435	PLUTONIUM Transuranic Nuclides in Plaice (Pleuronectes	tsellyuloznogo proizvodstva), W79-00415 5A
the Marine	Bony in the Pulsery Discourses STREET	Platessa) from the North-Eastern Irish Sea, W79-00077	Musculium Transversum in the Illinois River
e, sc	PIPING SYSTEMS Deflection of P.V.C. Pipe Under Burial Condi-	PODZOLIC SOILS	and an Acute Potassium Bioassay Method for the Species,
Paradian	tions, W79-00103	A Lysimetric Study of Waters in an Irrigated	W79-00443 5C
ertilized with	PLAICE	Pasture (In Russian), W79-00284	POLLUTANTS
5C	Transuranic Nuclides in Plaice (Pleuronectes	POLAND POLICE THE POLICE OF TH	Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Con-
ds. Stone 10.	Platessa) from the North-Eastern Irish Sea, W79-00077	Benthic Algae in a Pond After the Accumula- tion of Beet-Sugar Factory Wastes,	ventional and Oxygen Bleaching Sequences, W79-00419 5D
ects of Cadmi-	PLANNING	W79-00216	POLLUTION ABATEMENT
osures,	Regional Electric Energy Planning: A Case	Phytophilous Fauna in Ponds Fertilized with	Oil-Troubled Water,
roduction and	Study in the Politics of Scarce Resources, W79-00144 6E	Sugar Factory Wastes, W79-00217	W79-00169 5B
ake Michigan	Water Usage Requires Planning,	Biocenosis of a High Mountain Stream Under	On the Environmental Efficiency of Economic Systems,
5C	W79-00183 6D	the Influence of Tourism. 1. Chemism of the	W79-00230 6G
n Uptake in a	Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water	Rybi Potok Waters and the Chlorophyll Con- tent in Attached Algae and Seston in Relation	Conceptual and Statistical Issues in Developing Environmental Measures - Recent U.S. Ex-
on Dominated	Supply Facilities When Demand Depends on	to the Pollution, W79-00218	perience,
5C	Price, W79-00438 6A	Biocenosis of a High Mountain Stream Under	TOWNS CHORDON OF THE PERSONNEL IN THE PERSONNEL
s and Nitrate I Composition,	Residential Water Conservation, W79-00440 3D	the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok Stream,	POLLUTION TAXES (CHARGES) A Socio-Economic Approach to Water Pollution Law Enforcement in England and Wales, W79-00245 SG
SC SC	PLANT GROWTH	W79-00219 5C	610 15704
y Enzyme Ac- ce Washington	Effects of N:P Atomic Ratios and Nitrate Limitation on Algal Growth, Cell Composition, and Nitrate Uptake,	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The	POLYCHLORINATED BIPHENYLS A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the
5C	W79-00211 SC	High Tatra Mts, Poland) Polluted with Domestic Sewage,	Environment, W79-00289
elease and Its	Growth, Mortality, and Biomass Partitioning in	W79-00220 5C	Assessment of the Environmental Impacts on
e,	Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna	the Ban on Imports of PCBs, W79-00290 5G
SC SC	W79-00214 5C	of the Stream Rybi Potok (The High Tatra	PCB in Water, A Bibliography, Volume 3.
and Volume of in Chesapeake	Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited	Mts), W79-00221 5C	Destruction of Trace Toxic Compounds in
IMOD-PTW2L	Diatom Growth, W79-00229 5C	POLLUTANT IDENTIFICATION Geologic Studies to Identify the Source for	Water and Sludge by Ionizing Radiation, W79-00370 5D
PROGRAM ecomplishments Project Data.	Water Harvesting for Afforestation: II. Survival and Growth of Trees, W79-00475 3B	High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report, W79-00003 5A	POLYCHLORINATED TERPHENYLS Assessment of the Environmental Impacts on
AC100-YCM	PLANT GROWTH SUBSTANCES	Development of a Manometric Fish Bioassay	the Ban on Imports of PCBs, W79-00290 5G
very by Reverse	Water Relations of Fritted Clays, W79-00476 2G	Technique for Water Pollution, W79-00008 5A	POLYELECTROLYTES
Exchange Soft-		Is Chrysotile Asbestos Released from	Factors Influencing Induced Air Flotation, W79-00375 5D
3A	PLANT MORPHOLOGY Morphometric Changes in Asterionella For-	Asbestos-Cement Pipe into Drinking Water., W79-00013 5A	POLYMERS
Evaluation and	mosa Colonies Under Phosphate and Silicate	Aquatic Riotal Monitor Poll State Wildishing	Possible Use of Polymeric Materials for Fortifi- cation of Drainage Fills (In Russian),
of Seawater	W79-00215	W79-00033 5A	W79-00439 4A

POLYVINYL CHLORIDE

228/4/104	
POLYVINYL CHLORIDE Deflection of P.V.C. Pipe Under Burial Condi-	Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Sta- tion Wastewater Treatment System,
tions, W79-00103 8D	W79-00357 5D
TECH IN Water, A Ballography, V. Dank J.	Design Considerations for Wastewater Treat-
PONDS An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan	ment Systems at Existing Fossil Power Plants, W79-00358 5D
Dune Pond, W79-00205 SC	Waste Treatment for a Profit, W79-00359 5D
Benthic Algae in a Pond After the Accumula- tion of Bect-Sugar Factory Wastes,	Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
W79-00216 5C	W79-00360 Jan Comman G. J. S. S. S. S.
Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,	Case History: Ash Disposal from an Oil Fried Central Station,
W79-00217 5C	W79-00361
PORE WATER	POWERPLANTS
A Comparison of Ceramic and Teflon in Situ	Wet Cooling Tower Backfitting Economics,
Samplers for Pore Water Determinations,	W79-00233 5G
W79-00325 5A	PRE-IMPOUNDMENT
POROSITY	Organized Resistance to an Imposed Environ-
Relationships Among Some Physical Properties	mental Change. A Reservoir in Eastern Ken-
of Soil (In Slovenian),	tucky, W79-00142
W79-00451 2G	of Lymberta Study of witter to the friguest
POROUS MEDIA	PRECIPITATION ATMOSPHERIC
A New Finite Element Technique for the Solu-	A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions.
tion of Two-Phase Flow Through Porous Mcdia,	W79-00089 2B
W79-00135 2F	Solid State Event Recorder for Rainfall Mea-
POTABLE WATER	surement, W79-00125 2B
Is Chrysotile Asbestos Released from	W 79-00123
Asbestos-Cement Pipe into Drinking Water.,	Acid Precipitation in the Netherlands,
W79-00013 5A	W79-00138
Characterization of the Release of Chrysotile	Relation Between the St. Louis Urban
Asbestos from Asbestos-Cement Drinking Water Pipe,	Precipitation Anomaly and Synoptic Weather Factors,
W79-00435 5B	W79-00328 2B
POTASSIUM	Mass Balance Model for Calculation of Ionic
Musculium Transversum in the Illinois River	Input Loads in Atmospheric Fallout and
and an Acute Potassium Bioassay Method for the Species,	Discharge from a Mountainous Basin, W79-00332 5B
W79-00443 5C	Isotopic Composition of Sulfur in Precipitation
21730 11 11	Within the Great Lakes Basin,
POTATOES Water Relations and Physiological Activity of	W79-00339 5A
Potatoes,	PRECIPITATION INTENSITY
W79-00017	A Technique for Estimating Clock Two-Hourly
POTENTIOMETRIC LEVEL	Precipitation Rate Distributions,
Potentiometric Surface Map of the Floridan	W79-00089
Aquifer in the St. Johns River Water Manage-	PRESSURE
ment District and Vicinity, Florida, September,	Pressure Fluctuations Beneath Submerged
1977, W79-00275 7C	Jump, W79-00316 8B
The state of the s	A ALL REGULATE AND A WARRENCH ARREST COMPANY OF SALES
POTOMAC RIVER BASIN	PRESSURE FLUCTUATIONS Pressure Fluctuations Beneath Submerged
Water Resources Data for Pennsylvania, Water	Tuma.
Year 1977Volume 2. Susquehanna and Potomac River Basins.	W79-00316 8B
W79-00265 7C	PRICE RIVER (UTAH)

strumentation and Controls for Philadelphia	
ectric Company Eddystone Generating Sta-	
on Wastewater Treatment System,	
79-00357 5D	•
esign Considerations for Wastewater Treat-	
ent Systems at Existing Fossil Power Plants,	
79-00358 5D	,
aste Treatment for a Profit,	
79-00359 Start TARIO-41 V 5D)
ewatering of Sludges from Oil Fried Electric	
ower Generating Plants,	
79-00360 Lac . on the G. ac stat. 51	•
Deferring Studies of the Mon Cyallotte (2001)	
ase History: Ash Disposal from an Oil Fried	3
entral Station,	
79-00361	ŝ
allydrogeochemistry of a Calery Central	П
VERPLANTS	
et Cooling Tower Backfitting Economics,	
79-00233 50	2
MINERAL	
-IMPOUNDMENT	
rganized Resistance to an Imposed Environ	
ental Change. A Reservoir in Eastern Ken	-
cky,	
79-00142	3
CIPITATION ATMOSPHERIC Technique for Estimating Clock Two-Hourly	
Technique for Estimating Clock Two-Hourly	v
recipitation Rate Distributions.	
779-00089 21	
79-00089	
olid State Event Recorder for Rainfall Mea	
	-
rement,	
779-00125	3
Control of the state of the sta	
cid Precipitation in the Netherlands,	
779-00138	A
Annual Company of the	
elation Between the St. Louis Urba	n
recipitation Anomaly and Synoptic Weather	r
actors,	
779-00328	R
17.00220	-
lass Balance Model for Calculation of Ioni	•
iput Loads in Atmospheric Fallout and	d
ischarge from a Mountainous Basin,	
/79-00332	В
I free at an assistant war to read	
otopic Composition of Sulfur in Precipitation	n
ithin the Great Lakes Basin,	
779-00339 5/	
17-00337	*
ECIPITATION INTENSITY	
Technique for Estimating Clock Two-Hourl	y
recipitation Rate Distributions,	
/79-00089	8
ESSURE	
ressure Fluctuations Beneath Submerge	d
/70 00316	R
//9-00310	

Preliminary Identification of the Salt Pick-up

and Transport Processes in the Price River

Land Prices Substantially Underestimate the

Value of Environmental Quality, W79-00244 6C

Residential Water Conservation, 3D

Basin, Utah,

W79-00145

PRICES

5D

PRODUCTIVITY Water and Land Resource Accomplishments 1975, Statistical Appendix I. W79-00192 The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines, W79-00202 PROJECT FEASIBILITY Water and Land Resource Accomplishments 1975, Statistical Appendix III--Project Data. W79-00194 19 3F PROJECT PLANNING Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A, W79-00188 Summary of U.S. Geological Survey Investigations and Hydrologic Conditions in the Southwest Florida Water Management District for 1977, W79-00272 PROPERTY RIGHTS Property Rules, Liability Rules, and Environmental Economics, W79-00241 PROROCENTRUM Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circulation Patterns and Organism Distributions in the Chesapeake Bay, W79-00317 SC

PROTECTION

PRICING

W79-00205

W79-00214

W79-00097

W79-00123

door Recreation.

The Optimal Pricing of Undepletable Externali-

An Investigation of Primary Production and Ecosystem Metabolism in a Lake Michigan Dune Pond, best for how the harmyday.

Growth, Mortality, and Biomass Partitioning in Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),

PRIVATE RECREATIONAL INDUSTRY Needs of Private for Profit Enterprises in Out-

PROBABLE MAXIMUM PRECIPITATION Rainfall Frequencies for the Persian Gulf Coast

PRIMARY PRODUCTIVITY

sciolog (976,

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Economic Impacts of Pulp and Paper Industry

Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry

Impact Analyses.

W79-00342

W79-00355

POWER PLANTS
Water -- 1977.

Treatment of Liquid Wastes from Fossil Fuel

Use of Wastewater Treatment Ponds at TVA

Fossil Fueled Power Plants,

	and the second s		
DE ACCOUNT	Microbial Degradation of DDT,	Investigation of Factors Affecting BOD Mea-	RADIOCHEMICAL ANALYSIS
Externali-	W79-00278 SC	surement and Experience with the 1-Day BOD	Analysis of Radioactive Contaminants in By-
Statement of	SE ANDRESSES STATES AND	Test,	Products from Coal-Fired Power Plant Opera-
6C	Studies in Microbial Chemotactic Behavior in	W79-00405	tions,
Million K. I. St.	Seawater,		W79-00227 5A
	117-00255	Bioassay Results of Kraft Mill Effluent at Ar-	
luction and	PUBLIC POLICY	tificially Elevated Levels of Biosolids,	RADIOISOTOPES
e Michigan	Conceptual and Statistical Issues in Developing	W79-00406	Uptake of Americum-241 by Algae and Bac-
ngdava0"	Environmental Measures - Recent U.S. Ex-	Water and Land Addressing programmers of	teria,
SC SC	perience,	A Study of the Fate of Biosolids from Biologi-	W79-00067 5B
rtitioning in	W79-00232 6G	cally Treated Effluent in Laboratory and Con-	Transuranic Nuclides in Plaice (Pleuronectes
	Successives of Physical Resourch in the	structed Streams,	Platessa) from the North-Eastern Irish Sea,
ons of Wild	Distributional Implications of the Extended	W79-00407 COLATE A ACID AS A 5C	W79-00077 5B
ca), 5C	Economic Zone: Some Policy and Research Is-	Steam Stripping Reduces Condensate at Weyco	Selfetti Jonatain of Taylo and Haasoloon Sule-
Tinn a sec	sues in the Fishery,	Mill,	Analysis of Radioactive Contaminants in By-
rry	W79-00236 6E	11/70 00400	Products from Coal-Fired Power Plant Opera-
rises in Out-	W77 A Sell Co.	W/9-00409	tions,
200000000000000000000000000000000000000	Distributional Implications of Extended Fishe-	Process Design Investigations for Alaska Pulp	W79-00227
6B	ries Jurisdiction: Some Research and Policy Is-	Mill Wastewater Treatment Facilities,	RADIOMETRY
ON THE PARTY OF	sues: Discussion,	W79-00412 5D	Determination of Terrestrial Albedo from
TION	W79-00237 6E		LANDSAT I Satellite Imagery in Photographic
n Gulf Coast	Distributional Implications of the Extended	EPA's Goal for Suspended Solids is Not Met	Form,
1 (DO 127 N. 18.	Economic Zone: Some Policy and Research Is-	with Media Filtration,	W79-00012 7B
2B	sues in the Fishery: Discussion,	W79-00414 5D	theological food landest find a part of a
SAR DIVIDAR	W79-00238 6E	Store is a distribution united agrees	RADIUM TO A MARKET STATE AND ASSESSMENT OF THE PARTY OF T
Golf Selfs Co.	The main and the second land.	Energy Consumption for Electrodialysis of	Geologic Studies to Identify the Source for
omplishments	Land Prices Substantially Underestimate the	Spent Sulfite Liquors (Energozatraty na elek-	High Levels of Radium and Barium in Illinois
LC100-95W	Value of Environmental Quality,	trodializ otrabotannogo shcheloka sul'fitno-	Ground-Water Supplies: A Preliminary Report,
3F	W79-00244 6C	tsellyuloznogo proizvodstva),	W79-00003 5A
Disubst Dog	The state of the s	W79-00416 5D	Windshift Council States of Factors in the
Blanket Bog	PUBLICATIONS	Waste Tirestopen for a Profilips G. Waste Townson	RAIN NOSSE STREET IN THE PROPERTY OF THE PROPE
Pennines,	Summary of U.S. Geological Survey Investiga-	Electric Resistance of the Cation-Selective	Is Chrysotile Asbestos Released from
LIKEN SE M. TH	tions and Hydrologic Conditions in the	MK-40 Membrane During Electrodialysis of	Asbestos-Cement Pipe into Drinking Water.,
19 W. Chillian	Southwest Florida Water Management District	Spend Sulfite Liquor (Elektrosoprotivlenie ka-	W79-00013 5A
omplishments	for 1977,	tionoselektivnoy membrany MK-40 pri elek-	Determination of Chrysotile Asbestos in Rain-
ject Data.	W79-00272 4A	trodialze otrabotannogo sul'fitnogo shcheloka),	water.
JF JF		W79-00417 5A	W79-00014 5A
34/10038 Acc	PULP AND PAPER INDUSTRY		11 / 20014
Con the second	Collecting Bark Burner Ash with Electrostatic	Clarifier With Suspended Layer of Sediment	RAIN GAGES
A River Basin	Precipitators,	(Osvetlitel' so vzveshennym sloem osadka),	Solid State Event Recorder for Rainfall Mea-
CAMPONICANICA	W79-00163 5D	W79-00421 5D	surement,
5B	Water Reuse: A Trickle Becomes a Torrent,	THE RESERVE TO STREET STREET	W79-00125 2B
14/77 1487	W79-00400 3E	Analyses of Paper Machine Waters with Ion	Ward there are substituted for the
ACTIVITIES OF THE PARTY OF THE	W 79-00400	Specific Electrodes. Part IV. Sulfate Deter-	Electric Rainfall Intensity Sensor,
vey Investiga-	Looking at the Positive Side of Energy Regula-	mination Using Pb(2+) Ion Specific Electrode	W79-00329 2B
tions in the	tion,	and Various measurement Methods,	DAIN WATER
ement District	W79-00411 3E	W79-00429 5A	RAIN WATER
Je Opphowit	AND THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN		Investigation of Rainwater for the Presence of
4A	The Closed Mill Concept,	PUMPING	Asbestos,
	W79-00420 3E	Ground-Water Data, 1974-76, Indian Wells Val-	W79-00437 5A
VOND THE ST	CESSIONAL OF AUTO SERVINGE LINE IN NUMBER	ley, Kern, Inyo, and San Bernardino Counties,	RAINBOW TROUT
and Environ-	Economic Impacts of Pulp and Paper Industry	California,	Growth and Diets of Trout from Contrasting
a Silvations	Compliance with Environmental Regulations.	W79-00253 7C	Environments in a Geothermally Heated
6E	Volume I. Summary and Aggregate Industry		Stream: The Firehole River of Yellowstone Na-
(1000-199)	Impact Analyses.	PUMPS	tional Park,
	W79-00430 6E	Well Point Systems.	W79-00082 5C
of a Red Tide	PULP WASTES	W79-00182 8C	The state of the s
: Water Circu-	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3		RAINFALL
Distributions in	Nekoosa Cleans Condensates with Steam	QUICKFLOW	A Technique for Estimating Clock Two-Hourly
615,000 = 7 = -00,214	Distillation,	Factors Controlling Variations in River Water	Precipitation Rate Distributions,
5C	W79-00162 5D	Quality in Kansas,	W79-00089 2B
	The Radiation-Induced Degradation of Lignin	W79-00006 5B	
Denne Te dunter		the state of the s	Atmospheric Water-Vapor Resources for Rain-
Paper Industry	in Aqueous Solutions, W79-00164 5D	RADAR VESSELLE SHITS III I HOUSE	
al Regulations.	30	Agricultural and Hydrological Applications of	Plant Life, Annotated Bibliography.
regate Industry	Designing and Operating an Oxygen Activated	Radar: Final Report,	W79-00106 10C
STATES OF THE PARTY	Sludge System Including Tertiary Alum-Mud	W79-00464 7B	Local Differences in the Detterns of Variative
6E	Draginitation	BANKAT PLOMP	Local Differences in the Patterns of Variability
Margares A.	W79-00350 5D	KADIAL FLOWS	of Tropical Rainfall: Some Characteristics and Implications,
ron as Feologi	water Omitty Mag. Agorath A.	Air Entrainment in Radial Flow Towards In-	A CONTRACTOR OF THE PROPERTY OF THE PARTY OF
ozoa as Ecologi-	Sludge Treatment by Supersonic Jet-Flame,	takes,	W79-00113 2B
GILLIAN TON	W79-00403 5E	W79-00315 8B	Rainfall Frequencies for the Persian Gulf Coast
5A	Me and a control of the control of t	L. Wickley S. W. W. W. B. W.	of Iran.
	Biologically Active Substances in Pulping	RADIOACTIVE WASTES	W79-00123 2B
Derivatives on	Waste Liquors. I. Substances Active Against	Analysis of Radioactive Contaminants in By-	The second secon
s Forming Ac-	Termites, Coptotermes Formosanus Shiraki, in	Products from Coal-Fired Power Plant Opera-	Solid State Event Recorder for Rainfall Mea-
a Lounning rice	Kraft Pulping and Bleaching Wastes,	tions, A sandaged headed to a	surement,
5D	W79-00404 5D	W79-00227 5A	W79-00125 2B
100000000000000000000000000000000000000			

A Storm Rainfal Pattern Above the Central African Plateau, W79-00126 2B	Needs of Private for Profit Enterprises in Out- door Recreation. W79-00097	REMOTE SENSING Remote Water Monitoring System, W79-00047 7B
Climatology of Instantaneous Rainfall Rates, W79-00327 2B	Roles/Functions of Federal, State and Local Public Agencies.	Automatic System Cleaner for Remote Moni- tor.
Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors, W79-00328	W79-00098 6E RECREATION AREAS Water and Land Resource Accomplishments 1975, Statistical Appendix IIIProject Data.	W79-00051 5A Applications of Remote Sensing to Hydrologic Planning,
Electric Rainfall Intensity Sensor,	W79-00194 3F RECREATION DEMAND	W79-00099 7B Summaries of Physical Research in the
W79-00329 2B Relationship of Rainfall and Lake Groundwater Seepage,	Needs of Private for Profit Enterprises in Out- door Recreation. W79-00097	Geosciences. W79-00101
W79-00489 5B	RECREATION FACILITIES Roles/Functions of Federal, State and Local	Remote Monitoring of Coal Strip Mine Rehabilitation, W79-00226 5G
A Storm Rainfal Pattern Above the Central African Plateau, W79-00126	Public Agencies. W79-00098 6E	Agricultural and Hydrological Applications of Radar: Final Report, W79-00464 7B
RAINFALL INTENSITY A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions,	Water Quality in the Ozark National Scenic Riverways, Missouri, W79-00254 5B	REPAYMENT CONTRACTS Water and Land Resource Accomplishments
W79-00089 2B' Climatology of Instantaneous Rainfall Rates,	RECREATION USAGE Water and Land Resource Accomplishments 1975, Statistical Appendix I. W79-00192 3F	1975, Statistical Appendix II-Finances and Physical Features. W79-00193
W79-00327 2B Electric Rainfall Intensity Sensor, W79-00329 2B	RECYCLING Waste Treatment for a Profit,	RESEARCH PRIORITIES Research to Anticipate Environmental Impacts of Changing Resource Usage.
RAINFALL-RUNOFF RELATIONSHIP	W79-00359 5D The Feasibility of Using Forest Lands for	W79-00085 6G RESERVOIR MANAGEMENT
Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept, W79-00447	Recycling Sludge Nutrients in Northern New England, W79-00446	Operating Model for the Green River Basin Reservoir System, W79-00452
W79-00447 RAINFALL-RUNOFF RELATIONSHIPS Potential and Limitations of Rainfall-Runoff Models for Prediction on Ungauged Catchments: A Case Study from the Papua New Guinea Highlands,	RED TIDE Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated by Gonyaulax Polyedra, W79-00210 5C	RESERVOIR OPERATION Field Investigation of Selective Withdrawal, W79-00119 4A Optimal Operation of Shelbyville and Carlyle
W79-00491 2A REAERATION	Annual Subsurface Transport of a Red Tide Dinoflagellate to its Bloom Area: Water Circu- lation Patterns and Organism Distributions in	Lakes, W79-00392 Operating Model for the Green River Basin
Laboratory Studies of Gas Tracers for Reaera- tion, W79-00270 5A	the Chesapeake Bay, W79-00317 5C	Reservoir System, W79-00452
RECENT EPOCH Inland Ice Sheet Thinning Due to Holocene Warmth,	REFORESTATION Our Reclamation Future: The Missing Bet on Trees, W79-00086	Control of Water Residence Time in Smal Reservoirs, W79-00482
W79-00340 2C RECLAIMED WATER Reject Stream Replacement Study.	REGIONAL ANALYSIS Regional Geology Series: Part VII, The Colorado Plateau, W79-00177 8B	RESERVOIR YIELD Optimal Solution to the Timing, Sequencing and Sizing of Multiple Reservoir Surface Wate Supply Facilities When Demand Depends o
W79-00092 3A RECLAMATION	Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus	Price, W79-00438
Textile Waste Waters: Treatment and Environ- mental Effects, W79-00166 3E	Concept, W79-00447 5G	RESERVOIRS Overgrowing of the Kara Kum Canal and Som
RECREATION Protection of Outdoor Recreation Values of Rivers.	REGIONAL ELECTRIC ENERGY Regional Electric Energy Planning: A Case Study in the Politics of Scarce Resources, W79-00144 6E	Aftereffects of Introducing the White Amu into Water Bodies, (In Russian), W79-00207
W79-00093 6B Public Outdoor Recreation Benefits of Federal Water Resource Projects.	REGIONAL FLOOD Flood Regions in Jamaica, W79-00330 2E	W 75-00462
W79-00094 6E Federal Outdoor Recreation Land Acquisition-	REGULATION	Climate Change: Detection and Its Impact of Hydrologic Design, W79-00492
LWCF. W79-00095 6E	A Socio-Economic Approach to Water Pollu- tion Law Enforcement in England and Wales, W79-00245 SG	RESIDENCE TIME Control of Water Residence Time in Sma
Energy Conservation and Outdoor Recreation, W79-00096 6G	Lake Superior Regulation Effects, W79-00388 4C	Reservoirs, W79-00482

7B

Hydrologic
7B
ch in the
10F
Mine Reha5G
plications of

mplishments inances and 3F

ental Impacts 6G

River Basin

ithdrawal,
4A
e and Carlyle
4A
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4A

Time in Small

g. Sequencing, Surface Water and Depends on

anadath 6A

Canal and Some the White Amur

Time in Small

d Its Impact on

2E

Time in Small

RESINS Preliminary Study of Selected Potential En-	Supply Facilities When Demand Depends on Price,	Biocenosis of a High Mountain Stream Under
vironmental Contaminants Optical	W79-00438	the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The
Brighteners, Methyl Chloroform, Tri- Chloroethylene, Tetrachloroethylene and ion	RIVER FLOW	High Tatra Mts, Poland) Polluted with Domestic Sewage,
Exchange Resins,	Total Phosphorus Transport During Storm	W79-00220 5C
W79-00283	Events, W79-00478	Biocenosis of a High Mountain Stream Under
RESOURCES DEVELOPMENT	RIVER PROTECTION	the Influence of Tourism. 4. The Bottom Fauna
Research to Anticipate Environmental Impacts of Changing Resource Usage.	Protection of Outdoor Recreation Values of	of the Stream Rybi Potok (The High Tatra Mts),
W 13-00003 6G	Rivers. 100 dl land land to mannuesple	W79-00221 5C
RESPIRATION	15 (00-62.M.	SAFETY mother and americal to appropriate A
Effects of Feeding and of Chemical Stimulation on the Oxygen Uptake of Nassarius Reticulatus	A General Two Dimensional River Simulator,	Safety Aspects of Toxic and Hazardous Spills.
(Gastropoda: Prosobranchia), W79-00083	W79-00397 4 3 3 3 4 3 2 E	Management Plan for Control and Treatment of
The Photosynthetic and Respiratory Rates and	RIVERS Factors Controlling Variations in River Water	Toxic Substances, at any Language with march
Tolerances of Benthic Algae from a Mangrove	Quality in Kansas, waste by and waste to the	W79-00346
and Salt Marsh Estuary: A Comparative Study, W79-00204	W79-00006	SAINE SOILS
William water their place sweeth and by	Frazil Ice Formation: A Review,	Correlation Between the Salt Content in the Hard Phase and Soil Solutions of the Murghab
Seasonal Changes in Respiratory Enzyme Ac- tivity and Productivity in Lake Washington	W79-00120	Oasis Desert-Meadow Soils of Ancient Irriga-
Microplankton,	River Temperature Variation with Freezing and	tion, (In Russian), W79-00203
W79-00212	Storage, W79-00477 2E	Total William Museum Press, Statistical States Annual Telephone
REST AREAS	Checkung Spill asin of Windows Poliging	No Water Source Danage Found in Oil States
Water Reuse at Highway Rest Areas: Evalua-	ROCKFILL DAMS Using Ice as Water-Impermeable Element in	No Water-Source Damage Found in Oil States. W79-00172
tion Phase, W79-00087	Rockfill Dams,	2 73-00096
REVERSE OSMOSIS	W79-00466 8D	Preliminary Identification of the Salt Pick-up
Controls Drive Platers to Materials Recovery,	RUNOFF	and Transport Processes in the Price River
W79-00154 5D	A Field Evaluation of Subsurface and Surface	Basin, Utah, W79-00145 3C
Laboratory Studies on Advanced Composite H	Runoff, I. Tracer Studies, W79-00115	A Transport of the form of the same of the
F Modules for Seawater Reverse Osmosis, W79-00300 3A	A Field Evaluation of Subsurface and Surface	Survival and Oxygen Consumption of Young Kura Carp Under Various Keeping Conditions (In Russian),
Final Report on Field Test Evaluation and	Runoff, II. Runoff Processes, W79-00116	W79-00180 2H
Operation and Maintenance of Seawater Reverse Osmosis and Electrodialysis Pilot	An Estimate of Annual Runoff from England	Correlation Between the Salt Content in the
Plants at Wrightsville Beach Test Facility, November 1976,	and Wales, 1728-1976, W79-00124	Hard Phase and Soil Solutions of the Murghab Oasis Desert-Meadow Soils of Ancient Irriga-
W79-00302	Sampling and Modeling of Non-Point Sources	tion, (In Russian), W79-00203
REVIEWS	at a Coal-Fired Utility,	The second of th
Frazil Ice Formation: A Review,	W79-00279 5B	First Ecological Data on the Oyster Ponds in the Bay of Bourgneuf (In French),
W79-00120 2C	Rural Water Supplies from Laterite Runoff,	W79-00295 2L
Progress and Problems in the Study of Plant-	W79-00387	SALINITY STRUCTURE
Water Interrelations (In Bulgarian), W79-00187	The Application of Linear Programming to	The Effect of Reduced Wetlands and Storage
Carbon Cumer Coluga.	Run-Off Management, W79-00393	Basins on the Size, Stability and Productivity of the Watershed Mixing Zone,
Cattails (Typha Spp.)Weed Problem or Poten- tial Crop.,	Charles and the second section of the second section of	W79-00441 2L
W79-00198	Water Harvesting for Afforestation: I. Efficien- cy and Life Span of Asphalt Cover,	SALT MARSHES
RISK ANALYSIS		The Photosynthetic and Respiratory Rates and
Stochastic Processes in Water Resources En-	RURAL WATER QUALITY	Tolerances of Benthic Algae from a Mangrove
gineering. W79-00380 8B	Nature and Impact of Rural Stream Inputs on	and Salt Marsh Estuary: A Comparative Study, W79-00204 5C
President Advantage and the selections	Water Quality, W79-00483 5C	MANUAL INCOMES TO SECURIOR AND ADDRESS.
RIVER BASIN DEVELOPMENT Literature Review for Explore-I: A River Basin	The state of the second of the second of the	Numerical Study of Continuous Saltation
Water Quality Model. Appendix A, W79-00188 5B	RYBI POTOK (POLAND) Biocenosis of a High Mountain Stream Under	W79-00314 8B
Resident William who wanted by Audit William William William and Audit William	the Influence of Tourism. 1. Chemism of the Rybi Potok Waters and the Chlorophyll Con-	SAMPLING Beneta Water Monitoring System
User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B, W79-00189 5B	and the same at th	Remote Water Monitoring System, W79-00047 7B
The washing a bridge and bed a little	W79-00218 5C	Automatic System Cleaner for Remote Moni-
Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C, W79-00190 5B	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 2. Bacteria as an	tor, W79-00051
Study of the continue the continued wheel	Index of Water Pollution on the Rybi Potok	Nonmetallic Electrofishing Booms and Acces-
Optimal Solution to the Timing, Sequencing, and Sizing of Multiple Reservoir Surface Water	Stream, W79-00219 5C	sory Tackle, W79-00069 7B

SI

SI

SI SI

SI

SI

SII

SI

Collection Bucket for Use with Tow Nets for	Phytoplankton Extracellular Release and Its	SEWAGE
Larval Fish,	Relation to the Seasonal Cycle of Dissolved Or-	Characterization of Performance of Full-Scale
W79-00070 7B	ganic Carbon in a Eutrophic Lake, W79-00213 5C	Tertiary Wastewater Granular Media Filters, W79-00371
Quantitative Comparison of Seining and Un-	Boles Vice-mans of Tredness With Edit Market	ad blossoft with a Tetran Live of the Land of the Land
derwater Observation for Stream Fishery Sur-	SEDIMENT BOOK COMMENT ASTRONOMY ISSAT	SEWAGE BACTERIA
veys,	Environmental Management Strategy for the	Recovery of Sanitary-Indicator Bacteria from
W79-00072 7B	Great Lakes System.	Streams Containing Acid Mine Water, W79-00444
Artificial Substrate Sampler for Benthic Inver-	W79-00084 5G	William International State of the San
tebrates in Ponds, Small Lakes, and Reser-	SEDIMENT TRANSPORT	SEWAGE DISPOSAL
voire (RZM	Measurements of Bed Load in Oscillatory	Transpiration and Evaporation of Sewage Ef-
W79-00074 7B	Flow, Kuling-PTW	fluent, W79-00088 5D
A Comparison of Ceramic and Teflon in Situ	W79-00141 2J	The state of the s
Samplers for Pore Water Determinations.	SEDIMENTS	Biocenosis of a High Mountain Stream Under
W79-00325 5A	Mechanical Characteristics of Debris Flow,	the Influence of Tourism. 1. Chemism of the
N70 30487	W79-00117 2J	Rybi Potok Waters and the Chlorophyll Con-
SAN BERNARDINO COUNTY	MOTE AND THE PROPERTY OF THE PARTY OF THE PA	tent in Attached Algae and Seston in Relation to the Pollution,
Ground-Water Data, 1974-76, Indian Wells Val- ley, Kern, Inyo, and San Bernardino Counties,	The Determination of Quantity and Quality of	W79-00218 SC
California,	Great Lakes United States Shoreline Eroded	Car Swort State and proceedings for the processing
W79-00253 7C	Material, W79-00249 SB	Biocenosis of a High Mountain Stream Under
Correlation Retween the Salt Combot on the	W79-00249 5B	of the Stream Rybi Potok (The High Tatra
SARDINIA	Forms of Trace Elements in Soils, Sediments,	Man alle Agordan en announce de la constante d
The Phosphagens of Some Protozoa as Ecologi- cal Indicators (In French).	and Associated Waters: An Overview of Their	W79-00221 1072 E DAY (457-45 1475) 405 5C
W79-00423 SA	Determination and Biological Availability,	THE BOWLER REPORTED THE PARTY OF THE PARTY O
3A	W79-00271 5B	Simple Model for Ocean Outfall Plumes,
SATELLITES (ARTIFICIAL)	Continuous Simulation of Nonpoint Pollution,	W79-00479 5B
Applications of Remote Sensing to Hydrologic	W79-00493	SEWAGE EFFLUENTS
Planning,	traing for as Water transmissible Stiffendor in	Transpiration and Evaporation of Sewage Ef-
W79-00099 7B	SEEPAGE THE SEEPAGE LITTLE OF	fluent, W79-00088 5D
SCALING	Method and Composition for Preventing Water	W79-00088 5D
Low Molecular Weight Hydrolyzed Polyacryla-	Contaminated with Industrial Waste Seeping Through Soil Containing Said Water.	Tracing Sewage Effluent Recharge - Tucson,
mide Used as a Scale Inhibitor in Water	W79-00034 SG	Arizona,
Systems, W79-00027 5F	Minure J. Trucur Rassier	W79-00299 5A
win William and annual housewill	Relationship of Rainfall and Lake Groundwater	Survival and Early Growth of Selected Trees
Employing Methylene Phosphonates of Oxyal-	Scepage, W79-00489	on Waste Water Application Sites,
kylated Polyalkylene Polyamines in Chelation	The State of the S	W79-00422 5E
and/or Scale Inhibition, W79-00052 5F	Free-Surface Seepage Problem,	A Note on Effects of Sewage Effluent Irriga-
and all subtractions of the subtractions in a think the subtraction of	W79-00496 8D	tion on Specific Gravity and Growth Rate of
SCHEDULING	SEEPAGE CONTROL	White and Red Oaks,
Shortest Path Problems in Hydrogeology,	Seepage Control by Particle Size Selection,	W79-00425 5E
W79-00137	W79-00484 4A	SEWAGE LAGOONS
SCHUYLKILL RIVER (PENN)	CENCURE COLUMN TO A COLUMN TO SERVICE OF THE	Use of Wastewater Treatment Ponds at TVA
Environmental Effects of Schuylkill Oil Spill	Hydraulics of Great Lakes Inlets,	Fossil Fueled Power Plants, W79-00356 5D
II, June 1972.	W79-00469 8B	W79-00356
W79-00294 5C	- The and the land to the fact of the same of	SEWAGE TREATMENT
SCOUR	SEINE SURVEY	Treatment of Solids-Liquid-Gas Mixtures,
Scour of Bed Material in Very Rough Chan-	Quantitative Comparison of Seining and Un-	W79-00022 . ec
nels,	derwater Observation for Stream Fishery Sur-	Carbon Contact Column.
W79-00122 2J	veys, W79-00072	W79-00028
SEA ICE	and the second second second second	Biological Oxidation and Flotation Apparatus
Icebreaking Capability of CCGS 'Labrador' in	SELENIUM	and Method,
Western Barrow Strait, October 23-28, 1973,	Automated Determination of Selenium in	W79-00030
W79-00090 2C	Water, W79-00261	declaring Praymates on National Committee and Section 1
SEA WATER	W79-00261	Method for Treating Sewage, W79-00044 5D
Optical Classification of Natural Waters,	SELF-PURIFICATION	TO THE THEORY OF THE SEASON SHOW SEEDS AND THE
W79-00318 2L	Biocenosis of a High Mountain Stream Under	Transpiration and Evaporation of Sewage Ef-
and the state of t	the influence of Tourism. 2. Bacteria as an	fluent, W79-00088 5D
On-Site Generation of Hypochlorite Solutions	Index of Water Pollution on the Rybi Potok Stream,	W79-00088 5D
by Electrolysis of Seawater, W79-00372	Stream, W79-00219	Distribution of Heterotrophic and Nitrifying
	All the state of t	Dacteria within the Aerooic-Media Tricking
SEASONAL	SEPARATION TECHNIQUES	Filter, W79-00433
The Effects of Heavy Metals on Algae Popula-	Oil/Water Separation Technology: The Options	the street of th
tions in a South Central Reservoir, W79-00011 5C	Available - Part 2, W79-00158 5G	record media theking their replace to
3C	sales of a Share Security of Street Color	Nitrogen Control, W79-00445
Seasonal Changes in Respiratory Enzyme Ac-	SETTLEMENT (STRUCTURAL)	17-10-13
tivity and Productivity in Lake Washington	Groundwater Pumping Techniques for Excava-	A Study for Improving the Aerobic-Media
Microplankton, W79-00212 5C	tions and Other Works, W79-00185	Trickling Filter,
30	W79-00185 8G	W79-00457

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TVA 5D

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5D

SEWERS ALTONOMINATION DAMES AND ADDRESS OF THE PERSON	Simulation of Flows in Ungaged Basins,	SOCIAL CHANGE
Tunnel Component of the Tunnel and Reser-	W79-00331 2E	A Comparative Study of Community Response
voir Plan Proposed by the Metropolitan Sanita-	Madellin de West On Vend de Matellin	to Water Related Problems,
ry District of Greater Chicago, Lower Des	Modelling the Water Quality of the Hydrologi- cal Cycle.	W79-00010 6B
Plaines Tunnel System. W79-00465	W79-00379	SOCIAL IMPACT
And the state of the state of the state of the state of	to the second distributed their histories	Organized Resistance to an Imposed Environ-
SHALLOW LAKE EVAPORATION	Stochastic Processes in Water Resources En-	mental Change. A Reservoir in Eastern Ken-
A Simple Model for Shallow Lake Evapora-	gineering. W79-00380	tucky, and labole inches arethread find a
tion, W79-00326	managed when start and was the malacit	W79-00142 6B
A COUNTY AND PARTY AND A	Optimal Operation of Shelbyville and Carlyle	SOCIAL VALUES
SHEAR DRAG	Lakes, W79-00392	Organized Resistance to an Imposed Environ-
Eddy Production Inside Wall Layers,	W79-00392	mental Change. A Reservoir in Eastern Ken-
W79-00333	A General Two Dimensional River Simulator,	tucky,
SHORES	W79-00397 2E	W79-00142 6B
The Determination of Quantity and Quality of	A Water Quality Model for the South Platte	Modeling for Organizational Decision-Making:
Great Lakes United States Shoreline Eroded	River Basin, Documentation Report,	Profits vs. Social Values in Resource Manage-
Material,	W79-00398 20-1-1-10-1-10-1-10-1-15-15-15-15-15-15-15-15-15-15-15-15-1	ment,
W79-00249 5B	to Kipic Want Land Waster Land	W79-00243 6A
SHORTEST PATH	SIZE	SOCIOECONOMIC THEORY
Shortest Path Problems in Hydrogeology,	A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake	Natural Resource Economics: The Upsetting
W79-00137 6A	Bay,	Discipline,
SHRIMP	W79-00494 2L	W79-00242 6B
Toxicity of Sodium Pentachlorophenate (NA-	This programme is the second of the second o	SODA BUTTE
PCP) to the Grass Shrimp, Palaemonetes Pugio.	SKANE (SWEDEN)	Yellowstone National Park Survey May-August
at Different Stages of the Molt Cycle,	Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish	1970, Includes Soda Butte Survey, May-Oc-
W79-00078	Streams,	tober 1969.
SHUNT METERS	W79-00209 5C	W79-00250
Shunt Meters with Segmental Orifices,	and the section of the section of the section of	SODIUM COMPOUNDS
W79-00335	SKELETONEMA COSTATUM	Toxicity of Sodium Pentachlorophenate (NA-
to decide the Courty and GROSPETS of	Continuous Culture of Marine Diatoms Under Silicon Limitation. 3. A Model of Si-Limited	PCP) to the Grass Shrimp, Palaemonetes Pugio,
SILICATES	Diatom Growth,	at Different Stages of the Molt Cycle,
Morphometric Changes in Asterionella For-	W79-00229 5C	W79-00078
mosa Colonies Under Phosphate and Silicate	Tanana Maria Carata Anna Maria Cara Maria Maria Cara Maria Mar	al town
Limitation, W79-00215 5C	SLUDGE	Recovery of Tin from Electroplating Solutions and Rinse Waters,
W79-00215	Dewatering of Sludges from Oil Fried Electric	W79-00157
Formation of a Vermiculite Mineral from	Power Generating Plants, W79-00360 5D	A Sharker
Ground Water Components (In Russian),	1177 0000	SOIL AGGREGATES
W79-00382 2K	Case History: Ash Disposal from an Oil Fried	Relationships Among Some Physical Properties
SILICON STATE OF THE STATE OF T	Central Station,	of Soil (In Slovenian), W79-00451
Sea-Water Neutralization of Effluents from the	W79-00361 5E	W79-00451 2G
Industrial Processing of Phosphorite. A Case	SLUDGE DISPOSAL	SOIL COMPACTION
Study in the Practical Use of Basic Knowledge	Pretreatment Land Application of Textile Plant	Control of Furrow Infiltration by Compaction,
in Analytical and Marine Chemistry,	Wastes,	W79-00481 3F
W79-00151 5G	W79-00362 5E	SOIL CONSERVATION
Continuous Culture of Marine Diatoms Under	The Feasibility of Using Forest Lands for	Soil, Water and Air Sciences Research.
Silicon Limitation. 3. A Model of Si-Limited	Recycling Sludge Nutrients in Northern New	W79-00105 2G
Diatom Growth,	England,	The United States and the Control of
W79-00229 5C	W79-00446 5E	SOIL EROSION
SILICONES	Leaching Characteristics of Various Hanny	Grazing and Logging Effects on Soil Surface Changes in Central Colorado's Ponderosa Pine
UNOX Wastewater Treatment System Per-	Leaching Characteristics of Various Heavy Metals, Non-Heavy Metals and Anions from	Type,
formance Silicone Chemical Complex,	Municipal Sewage Sludge Ash,	W79-00140 4C
W79-00349 5D	W79-00459 5B	W. Vi. of a control of last, we at Name of the Charles of March of
	Stree Raise, Dacamentalon Sendy,	Methodical Problems in the Evaluation and
SILURIAN DOLOMITE	SLUDGE TREATMENT	Mapping of Erosion-Endangered Lands (In
Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination	Water 1977. W79-00342 5D	Russian), W79-00462 : 2J
Potential in the Silurian Dolomite,	W79-00342 5D	W 75-00402
W79-00256 5B	Sludge Treatment by Supersonic Jet-Flame,	SOIL MECHANICS
	W79-00403 5E	Deflection of P.V.C. Pipe Under Burial Condi-
SIMULATION ANALYSIS	SNAILS	tions,
Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,	SNAILS Effects of Feeding and of Chemical Stimulation	W79-00103 8D
W79-00188 5B	on the Oxygen Uptake of Nassarius Reticulatus	
TOPOSM WALLA	(Gastropoda: Prosobranchia),	A Lysimetric Study of Waters in an Irrigated
User's Manual for EXPLORE-I: A River Basin	W79-00083 5C	The state of the s
Water Quality Model. Appendix B,	SNORKEL SURVEY	W79-00284 2G
W79-00189 5B	Quantitative Comparison of Seining and Un-	Field Observations of the Moisture Regime of a
Programmer's Manual for EXPLORE-I: A	derwater Observation for Stream Fishery Sur-	
River Basin Water Quality. Appendix C,	veys,	ern Otago,
W79-00190 5B	W79-00072 7B	

		- manager
Changes in Water Regime of Brown Forest Soils of the Georgian SSR Under the Effect of	SOLID WASTES Adsorption of Some Toxic Substances by	SOYBEANS Nitrate Reductase Activity of Soybeans in
Silvicultural Practices, (In Russian),	Waste Components,	Relation to other Indicators of Water Stress,
W79-00401 4C	W79-00152 5B	W79-00149
Relationships Among Some Physical Properties	SOLIDS CONTACT PROCESS	With the same of t
of Soil (In Slovenian),	Solid-Fluid Contacting Process,	SPECIES COMPOSITION Phytophilous Fauna in Ponds Fertilized with
W79-00451 2G	W79-00029	Sugar Factory Wastes,
A Soil Moisture Budget Model Accounting for	SOLONETZER	W79-00217 SC
Shallow Water Table Influences,	Reclamation of Meadow-Chernozem	Arrivas arrise
W79-00473 2G	Solonetzes of the Kustanai Oblast, (In Rus-	SPECIES DIVERSITY
SOIL PHYSICAL PROPERTIES	sian),	Diversity and Environments of Benthic Inver-
Deflection of P.V.C. Pipe Under Burial Condi-	W79-00395 2G	tebrate Communities in South Swedish Streams,
tions,	SOLUBILITY	W79-00209 5C
W79-00103 8D	The Environmental Effects of Chromium in	The second state of the second state of the second
Water and Physical Properties of the Sod-Cal-	Tannery Effluents,	Species Diversity Indices of the Fish Popula-
careous Soils of the Crimean Foothills (In Rus-	W79-00156 5C	tions of Streams Draining Selected Test Areas
sian),	Recovery of Tin from Electroplating Solutions	on Eglin Air Force Base Reservation Florida, W79-00277
W79-00269 2G	and Rinse Waters,	W 19-00211
Relationships Among Some Physical Properties	W79-00157 5D	A Periphytic Microflora Analysis of the
of Soil (In Slovenian),	SOLUTES	Colorado River and Major Tributaries in Grand
W79-00451 2G	Solute Transport During Absorption of Water	Canyon and Vicinity,
SOIL BLANT WATER BELLMIONSHIPS	by Soil: Laboratory Studies and their Practical	W79-00285 5A
SOIL-PLANT-WATER RELATIONSHIPS Water Harvesting for Afforestation: II. Sur-	Implications,	SPECIES DIVERSITY INDICES
vival and Growth of Trees,	W79-00472 2G	Species Diversity Indices of the Fish Popula-
W79-00475 3B	SOLVENT EXTRACTION	tions of Streams Draining Selected Test Areas
The register of the artists are all the second and the second and the second are all the second and the second are all the seco	Water 1977.	on Eglin Air Force Base Reservation Florida,
SOIL SEALANTS Method and Composition for Preventing Water	W79-00342 5D	W79-00277 7C
Contaminated with Industrial Waste Seeping	Solvent Extraction for Treatment of Waste-	SPECIFIC GRAVITY
Through Soil Containing Said Water,	waters from Acetic-Acid Manufacture.	A Note on Effects of Sewage Effluent Irriga-
W79-00034 5G	W79-00366 5D	tion on Specific Gravity and Growth Rate of
SOIL STABILITY	The state of the s	White and Red Oaks,
Stabilization of Earth Subsurface Layers,	SOLVENTS	W79-00425 5E
W79-00035 8D	Preliminary Study of Selected Potential En- vironmental Contaminants - Optical	a 1845 Som also primet subard aman(rta) 1880a.
modules gehaloutent most of the greenists,	Brighteners, Methyl Chloroform, Tri-	SPECIFIC ION ELECTRODE
SOIL TREATMENT	Chloroethylene, Tetrachloroethylene and ion	Ion Selective Electrodes in Water Quality Anal-
Pretreatment Land Application of Textile Plant Wastes,	Exchange Resins,	ysis, W79-00223
W79-00362 5E	W79-00283 5A	W79-00223
Relationships Among Joses Properties Properties	SONOITA CREEK BASIN (ARIZ)	SPILLWAYS
Effect of Whey Application on Chemical Pro- perties of Soils and Crops,	Determination of Terrestrial Albedo from	Hydraulic Model Investigation of a Two-Way
W79-00363 5E	LANDSAT I Satellite Imagery in Photographic	Drop Inlet for Floodwater Retarding Structure
	Form,	No. 3, Banklick Creek Watershed, Boone and
SOIL WATER MOVEMENT	W79-00012 7B	Kenton Counties, Kentucky, W79-00341
Steady Infiltration from Single and Periodic Strip Sources.	SORGHUM	W79-00341
W79-00471 2G	Stomatal and Nonstomatal Regulation of Water	SPOIL BANKS
Company managed at A hear total Sept.	Use in Cotton, Corn and Sorghum,	Determination of Spoil-Bank Erosion Rates in
Solute Transport During Absorption of Water	W79-00016 2I	Ohio by Using Interbank Sediment Accumula-
by Soil: Laboratory Studies and their Practical Implications,	SORPTION	tions,
W79-00472 2G	Sorption Capabilities of Various Materials for	W79-00495 2J
William to wants believe an interes-	Leachate Treatment,	SPRAY IRRIGATION
SOIL-WATER-PLANT RELATIONSHIPS	W79-00377 5D	Transpiration and Evaporation of Sewage Ef-
Progress and Problems in the Study of Plant- Water Interrelations (In Bulgarian),	SOUTH PLATTE RIVER BASIN (COLORADO)	fluent,
W79-00187 2I	A Water Quality Model for the South Platte	W79-00088 5D
	River Basin, Documentation Report,	SPRINGS 3VM03000AM032
SOILS Irrigated Soils of the Milskaya Plain (In Rus-	W79-00398 5B	A Novel Method of Estimating the Discharge
sian),	SOUTH VIETNAM	of Water from Mound Springs of the Great Ar-
W79-00060 2G	Hydrogeologic Reconnaissance of the Mekong	tesian Basin, Central Australia,
ETIN VIA MINISTER	Delta in South Vietnam and Cambodia, W79-00255	W79-00112 2F
Reclamation of Meadow-Chernozem Solonetzes of the Kustanai Oblast, (In Rus-	W79-00255 7C	SPRINKLER IRRIGATION
sian),	SOUTHWEST NEBRASKA	Aboveground Sprinkling Device for Sprinkling
W79-00395 2G	Ground-Water Availability in the Hitchcock-	System,
SULL MODALER	Red Willow, Frenchman Valley, and Meeker-	W79-00059 3F
Housing Project to Utilize Ground Water.	Driftwood Irrigation Districts, Southwest Nebraska,	User's Manual for EXPLICITED A Store Bound
W79-00178 8C	W79-00260 4B	ST. JOHNS RIVER WATER MANAGEMENT
Provide the second seco		Potentiometric Surface Map of the Floridan
SOLDIER CREEK DAM (UT) Water and Land Resource Accomplishments	SOVIET UNION On the Environmental Efficiency of Economic	Aquifer in the St. Johns River Water Manage- ment District and Vicinity, Florida, September,
1975. Summary Report.	On the Environmental Efficiency of Economic Systems,	1977,
W79-00191 3F	W79-00230 . 6G	W79-00275

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Populaest Areas lorida,

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Populaest Areas Plorida, 7C

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n Rates in Accumula-

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Discharge Great Ar-

2F

Sprinkling 3F

September,

MENT le Floridan er Manage-

ST. LAWRENCE RIVER BASIN Water Resources Data for Pennsylvania, Water Year 1977-Volume 3. Ohio River and St.	Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus Concept,	Origin and Transport of Large Boulders in Mountain Streams, W79-00490
Lawrence River Basins. W79-00268 7C	W79-00447	STREPTOCOCCUS
STATESCO ANALYSIS SERVIANA CONTATE	Factors Affecting the Quality of Urban Runoff	Recovery of Sanitary-Indicator Bacteria from
ST. LOUIS (MO) Relation Between the St. Louis Urban	in Four Watersheds Within the City of Knox- ville, Tennessee,	Streams Containing Acid Mine Water,
Precipitation Anomaly and Synoptic Weather	W79-00456 5B	W79-00444 5A
Factors, W79-00328 2B	STRAIT OF GEORGIA (CANADA)	STRIP MINES
STATE GOVERNMENT	Regional Response to Forcing in Southern	Influence of Strip Mines on Regional Ground- Water Flow,
Roles/Functions of Federal, State and Local	Strait of Georgia, W79-00324 2L	W79-00118 5G
Public Agencies.	61700-01-0-0	Remote Monitoring of Coal Strip Mine Reha-
W79-00098 6E	STRAITS On Geostrophic Adjustment in Sea Straits and	bilitation,
STATISTICAL METHODS	Wide Estuaries. Part I: One-Layer System,	W79-00226
Stream Temperature Estimation Using Kalman Filter,	W79-00131 2L	STRIP MINING
W79-00121 5B	Regional Response to Forcing in Southern	Our Reclamation Future: The Missing Bet on
Influence of Methodological Factors on Plate	Strait of Georgia, W79-00324 2L	Trees, W79-00086
Counting of Aquatic Bacteria: I. Statistical	The grown of the control of the cont	Charles and teaching on a Manual State of the
Analysis of the Incidence of Time Lasting from Sample collection Up to Commencement of	On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Ex-	SUBMERGED JUMP Pressure Fluctuations Beneath Submerged
Counting, (In Spanish).	periments. Part II - Two-Layer System,	Jump,
W79-00385	W79-00497 2L	W79-00316 8B
STEAM	STRATIFICATION	SUBMERGENCE
Nekoosa Cleans Condensates with Steam	Field Investigation of Selective Withdrawal,	Pressure Fluctuations Beneath Submerged
Distillation, W79-00162 5D	W79-00119 4A	Jump, W79-00316
	STREAM INPUTS	collection of the series of th
Steam Stripping Reduces Condensate at Weyco Mill,	Nature and Impact of Rural Stream Inputs on Water Quality,	SUBSIDIES Economic Analysis of Selected Features of
W79-00409	W79-00483	Municipal Wastewater Construction Grant
How to Utilize Steam from Thermorefiners.	STREAMFLOW	Legislation, W79-00246
(Hur utnyttja anga fran termoraffinoerer), W79-00418	Low-Flow Characteristics of Oklahoma	
THE CATEGORY AND A SECOND SECOND SECOND	Streams, W79-00257 2E	SUBSURFACE FLOW Stabilization of Earth Subsurface Layers,
STOCHASTIC PROCESSES Stochastic Processes in Water Resources En-	Low-Flow Characteristics of Streams on the	W79-00035
gineering.	Olympic Peninsula, Washington,	SUBSURFACE RUNOFF
W79-00380 8B	W79-00258	A Field Evaluation of Subsurface and Surface
Stormwater Modeling,	High-Flow Frequencies for Selected Streams in	Runoff, I. Tracer Studies,
W79-00381 5B	Oklahoma, W79-00273 2E	W79-00115 2E
STOMATA	A PRODUCT OF THE PARTY OF THE P	A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,
Stomatal and Nonstomatal Regulation of Water Use in Cotton, Corn and Sorghum,	Climate Change: Detection and Its Impact on Hydrologic Design,	W79-00116
W79-00016 2I	W79-00492 2E	Districts of Investment Districts, Southwest
Water Relations and Physiological Activity of	STREAMFLOW FORECASTING	SUCCESSION Biocenosis of a High Mountain Stream Under
Potatoes,	Low-Flow Characteristics of Streams on the	the Influence of Tourism. 3. Attached Algae
W79-00017 2I	Olympic Peninsula, Washington, W79-00258	Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with
STONEFLIES Projection of Bridge	5. T. Historius 173, 78.	Domestic Sewage,
Adaptations and Resistance to Anoxia in Cloeon Dipterum (Ephemeroptera) and Nemou-	STREAMS Stream Temperature Estimation Using Kalman	W79-00220 5C
ra Cinerea (Plecoptera),	Filter,	SUGAR INDUSTRY
W79-00076	W79-00121 5B	Benthic Algae in a Pond After the Accumula-
STORM RUNOFF	Species Diversity Indices of the Fish Popula-	tion of Beet-Sugar Factory Wastes, W79-00216
High-Flow Frequencies for Selected Streams in Oklahoma.	tions of Streams Draining Selected Test Areas on Eglin Air Force Base Reservation Florida,	
W79-00273 2E	W79-00277	Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
Regionalization of Stormwater Response for	Longitudinal Dispersion of Fluid Particles in	W79-00217 5C
the Tennessee Valley Using the Lag Modulus	Mountain Streams: I. Theory and Field	SUGARBEETS
Concept, W79-00447 5G	Evidence, W79-00308 5B	Effect of Soil-Injected Ethylene on Sugarbeet
AND DESIGNATION OF A PROPERTY	of the Smales to accommist additional	(Beta Vulgaris L.) Yield Parameters, W79-00296 3F
STORM WATER Stormwater Modeling.	Longitudinal Dispersion of Fluid Particles in Mountain Streams: 2. Similarity of the Mean	Water Sammersky Social for Commercial Williams
W79-00381 5B	Motion and Its Application,	SULFATES
STORMWATER	W79-00309 5B	Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Deter-
Characterization and Treatment of Stormwater	Nature and Impact of Rural Stream Inputs on	mination Using Pb(2+) Ion Specific Electrode
Runoff, W79-00005	Water Quality, W79-00483	and Various measurement Methods, W79-00429

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SULFITE LIQUORS	Water Resources Data for Pennsylvania, Water	SYNTHETIC RUBBER
Flame-Photometric Method for the Determina- tion of Magnesium in Spent Liquors of Sulfite	Year 1977Volume 3. Ohio River and St. Lawrence River Basins.	Biological Effects and Environmental Aspects of 1,3-Butadiene,
Pulp Mills (Plamennosotometricheskii method	W79-00268 7C	W79-00292 ZEASE 19 A STATE SC
opredeleniya magniya v shchelokakh sul'fitno-	Forms of Trace Elements in Soils, Sediments,	N.V.S.P.K.A.
tsellyuloznogo proizvodstva), W79-00415	and Associated Waters: An Overview of Their	WASOPT Users Manual: An Integer Pro-
W/9-00413	Determination and Biological Availability,	gramming Methodology for Municipal/Regional
Energy Consumption for Electrodialysis of	W79-00271 5B	Water Supply Planning,
Spent Sulfite Liquors (Energozatraty na elek- trodializ otrabotannogo shcheloka sul'fitno-	Water-Resources Appraisal of the Wet Moun-	W79-00002 6A
tsellyuloznogo proizvodstva),	tain Valley, in Parts of Custer and Fremont	Conjunctive Use of Ground and Surface
W79-00416 5D	Counties, Colorado, W79-00274	Water,
Electric Resistance of the Cation-Selective	W79-00274 4B	W79-00170 4B
MK-40 Membrane During Electrodialysis of	SURVEYING INSTRUMENTS	TANNERY WASTES
Spend Sulfite Liquor (Elektrosoprotivlenie ka-	Remote Monitoring of Coal Strip Mine Rehabilitation,	The Environmental Effects of Chromium in
tionoselektivnoy membrany MK-40 pri elek- trodialze otrabotannogo sul'fitnogo sheheloka),	W79-00226 5G	Tannery Effluents, W79-00156 5C
W79-00417		W79-00156 5C
SULFITE PULP MILLS	SURVEYS Quantitative Comparison of Seining and Un-	TEMPERATURE
Development of an Effluent-Free Sulfite Pulp	derwater Observation for Stream Fishery Sur-	First Ecological Data on the Oyster Ponds in
Mill (Entwicklung zur abwasserfrei arbeitenden	veys,	the Bay of Bourgneuf (In French), W79-00295
Sulfitzellstoff-fabrik), W79-00424 SD	W79-00072 7B	Sarola collection Un to Communication alorest
W79-00424 5D	Electrical-Resistivity Surveys for Groundwater	TENNESSEE Literage All adhance
SULFUR	in the Deccan Trap Country of Sangli District,	Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knox-
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthes-	Maharashtra, W79-00107	ville, Tennessee,
is, (In Russian),	WORKSHIP STORY STORY OF STREET STORY STORY	W79-00456 5B
W79-00200 2I	The Demand for Clean Water: The Case of the	TENNESSEE VALLEY
Isotopic Composition of Sulfur in Precipitation	Charles River, W79-00234 6B	Regionalization of Stormwater Response for
Within the Great Lakes Basin,	and the product of the first transfer of the first second	the Tennessee Valley Using the Lag Modulus
W79-00339 5A	Chemistry of Small Norwegian Lakes, with	Concept, W79-00447
SULFUR BACTERIA	Special Reference to Acid Precipitation, W79-00321 5A	W79-00447 5G
Control of Nuisance Odors from Ponds by the	WOLTHA ANTE	TENNESSEE VALLEY AUTHORITY
Use of Bacteria Cultures,	SUSPENDED SOLIDS	Use of Wastewater Treatment Ponds at TVA
W79-00374 611	Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,	Fossil Fueled Power Plants, W79-00356 SD
SUPPLEMENTAL IRRIGATION	W79-00352 5D	W79-00356
Ground-Water Availability in the Hitchcock-	EPA's Goal for Suspended Solids is Not Met	TERATOGENS
Red Willow, Frenchman Valley, and Meeker- Driftwood Irrigation Districts, Southwest	with Media Filtration,	Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model
Nebraska,	W79-00414 5D	Ecosystem,
W79-00260 4B	Control of Water Residence Time in Small	W79-00061 5B
SURFACE-GROUNDWATER RELATIONSHIPS	Reservoirs,	Preliminary Study of Selected Potential En-
Ground-Water Availability in the Hitchcock-	W79-00482 4A	vironmental Contaminants - Optical
Red Willow, Frenchman Valley, and Meeker-	SUSQUEHANNA RIVER BASIN	Brighteners, Methyl Chloroform, Tri-
Driftwood Irrigation Districts, Southwest Nebraska,	Water Resources Data for Pennsylvania, Water	Chloroethylene, Tetrachloroethylene and ion
W79-00260 4B	Year 1977Volume 2. Susquehanna and	Exchange Resins, W79-00283
	Potomac River Basins. W79-00265 7C	W 17-00203
SURFACE RUNOFF A Field Evaluation of Subsurface and Surface	Citypies Prantica, Wallington, Militaria	TERTIARY TREATMENT
Runoff, I. Tracer Studies,	SWAB MATERIALS	Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters,
W79-00115 2E	B. R. /Hanson ;I. A. /Schipper W79-00150 5C	W79-00371 5D
A Field Evaluation of Subsurface and Surface	contail and contained management supplied	A DESCRIPTION OF THE PROPERTY
Runoff, II. Runoff Processes,	SWEDEN	TESTING PROCEDURES Investigation of Factors Affecting BOD Mea-
W79-00116 2E	Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish	surement and Experience with the 1-Day BOD
SURFACE WATER	Streams,	TANK RUNOKER SONOTE
Water Resources Data for Wisconsin, Water	W79-00209 5C	W79-00405
Year 1977.	Wet Meadows in Southern Sweden: Vegeta-	TEXTILES
W79-00267 7C	tion, Succession and Management (In	Waste Water Treatment and Re-use within the
SURFACE WATERS	Swedish),	Textile Industry, W79-00165
Hydrogeologic Reconnaissance of the Mekong	W79-00288 2I	W79-00165 5D
Delta in South Vietnam and Cambodia, W79-00255	SWIMMING	Textile Waste Waters: Treatment and Environ-
	Quantitative Comparison of Seining and Un-	wry-00166 3E
Water Resources Data for Pennsylvania, Water Year 1977Volume 2. Susquehanna and	derwater Observation for Stream Fishery Surveys.	W79-00166
Potomac River Basins.	W79-00072 7B	Pretreatment Land Application of Textile Plant
W79-00265 7C		Wastes, W79-00362 5E
Water Resources Data for Pennsylvania, Water	Continuous Electrochemical Synthesis Using a	W79-00362 5E
Year 1977Volume 1. Delaware River Basin.	Packed Granular Electrode,	Biological Evaluation of Acute Toxicity of
W79-00266 7C	W79-00432 5D	Selected Finishing Agents (Biologiczna ocena

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toksyczności ostrej wybranych środkow pomocniczych), W79-00413	Criteria Document for Toxaphene. W79-00281	Safety Aspects of Toxic and Hazardous Spills, W79-00345 5G
THE NETHERLANDS	Criteria Documents for Aldrin/Dieldrin. W79-00282 5A	Management Plan for Control and Treatment of Toxic Substances,
Acid Precipitation in the Netherlands, W79-00138	Manual of Analytical Quality Control for Pesti-	W79-00346
A Simple Model for Shallow Lake Evapora-	cides and Related Compounds in Human and Environmental Samples,	Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
tion, W79-00326 2D	W79-00287 5A	W79-00370 5D
THEORETICAL ANALYSIS	Multimedia LevelsMercury, W79-00291 5B	Biological Evaluation of Acute Toxicity of
Natural Resource Economics: The Upsetting	ENTRY MALE OF THAT A CHIEF OF	Selected Finishing Agents (Biologiczna ocena toksyczności ostrej wybranych srodkow
Discipline, W79-00242 6B	Development of a Manometric Fish Bioassay	pomocniczych), W79-00413 SC
Steady Infiltration from Single and Periodic	Technique for Water Pollution, W79-00008	TOXICITY TESTING
Strip Sources, W79-00471 2G	A Comparative In Vitro Study of the Effects of	Acute and Chronic Oral Toxicity of Chl-
Internal Fronts in Two-Layer Flo,	Various Balanced Saline Solutions on Respira- tion Rates of Liver Tissues of Three Fish Spe-	roinated Dibenzofurans to Salmonid Fishes, W79-00062 5C
W79-00486 8B	cies, W79-00454	The Toxicity of Phthalates to the Marine
THERMAL CONDUCTIVITY Energy Conversion System,	TOCCOA FALLS DAM	Dinoflagellate Gymnodinium Breve, W79-00063
W79-00037	Analysis of Flood Resulting from the Toccoa	The state of the s
THERMAL POLLUTION	Falls, Georgia, Dam Break, W79-00262 2E	Toxicity of the Fungicide Captan to the Dunge- ness Crab Cancer Magister,
Ecology of Dreissena Polymorpha (Pall.)	DC 1.	W79-00065
(Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,	TOXAPHENE Criteria Document for Toxaphene.	Toxicity of Sodium Pentachlorophenate (NA-
W79-00068 5C	W79-00281 5A	PCP) to the Grass Shrimp, Palaemonetes Pugio,
THERMAL WATER	TOXICITY	at Different Stages of the Molt Cycle, W79-00078
Digging for New Sources of Energy. W79-00175	Acute and Chronic Oral Toxicity of Chl- roinated Dibenzofurans to Salmonid Fishes.	W79-00078 5C The Effect of Naphthalene on Survival and Ac-
THERMOMECHANICAL PULPING	W79-00062 5C	tivity of the Amphipod Parhyale,
How to Utilize Steam from Thermorefiners.	The Toxicity of Phthalates to the Marine	W79-00081
(Hur utnyttja anga fran termoraffinoerer), W79-00418	Dinoflagellate Gymnodinium Breve, W79-00063 5C	Adsorption of Some Toxic Substances by
TIDAL EFFECTS	17100-87W-1	Waste Components,
Regional Response to Forcing in Southern Strait of Georgia,	The Toxicity of Manganese Ethylenebisdithic- carbamate to the Adult Newt, Triturus Cristatus,	W79-00152 5B
W79-00324 2L	W79-00064 5C	TRACE ELEMENTS The Effects of Heavy Metals on Algae Popula-
TIDAL MARSHES Changes in Interstitial Water Salinity of a Mis-	Toxicity of the Fungicide Captan to the Dunge-	tions in a South Central Reservoir, W79-00011 5C
sissippi Tidal Marsh, W79-00338 2L	ness Crab Cancer Magister, W79-00065	Automated Determination of Selenium in
TIN COLUMN ALL SOLD PROPERTY OF THE PROPERTY O	Toxicity of Sodium Pentachlorophenate (NA-	Water,
Recovery of Tin from Electroplating Solutions	PCP) to the Grass Shrimp, Palaemonetes Pugio, at Different Stages of the Molt Cycle,	W79-00261
and Rinse Waters, W79-00157 5D	W79-00078 5C	Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their
TISSUE ANALYSIS	The Effect of Naphthalene on Survival and Ac-	Determination and Biological Availability, W79-00271 5B
Uptake and FAte of DI-2-Ethylhexyl Phthalate	tivity of the Amphipod Parhyale, W79-00081 5C	The second secon
in Aquatic Organisms and in a Model Ecosystem,	The Environmental Effects of Chromium in	TRACE METALS Effects of Municipal Sewage Effluent Irriga-
W79-00061 5B	Tannery Effluents,	tion on the Trace Metal Content of
Acute and Chronic Oral Toxicity of Chl-	W79-00156 5C	Earthworms,
roinated Dibenzofurans to Salmonid Fishes, W79-00062 5C	Controlling and Monitoring Activated-Sludge Units,	W79-00009 5C
	W79-00160 5D	A Field Evaluation of Subsurface and Surface
The Toxicity of Manganese Ethylenebisdithic- carbamate to the Adult Newt, Triturus Cristatus,	Biological Effects and Environmental Aspects of 1,3-Butadiene,	Runoff, I. Tracer Studies, W79-00115 2E
W79-00064 5C	W79-00292 5C	Laboratory Studies of Gas Tracers for Reaera-
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,	Studies in Microbial Chemotactic Behavior in Seawater,	tion, W79-00270
W79-00077 5B	W79-00293 5C	Tracing Sewage Effluent Recharge - Tucson,
Identification of Kepone Alteration Products in Soil and Mullet,	Modeling and Monitoring of Toxic Spills and Toxic Effluents,	Arizona, W79-00299
W79-00080 5A	W79-00343 5B	Chlorofluorocarbons as Hydrologic Tracers A
Criteria Document for DDT.	The Biological Effects of Toxic Material Spills,	New Technology,
W70 00276	31/70 00244	W70 00461

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TRANSPIRATION

	· Warm the real Plans for Young why made William	SVOTUSTIC RUBBLE
TRANSPIRATION Chemical Inhibitors of Plant Transpiration: IV. Action of Alar-85, (In French), W79-00247 2D	ULTRAFILTRATION Characterization of Spent Bleaching Liquors. Part 1. Ultrafiltration of Effluents from Conventional and Oxygen Bleaching Sequences, W79-00419 5D	Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knox-ville, Tennessee, W79-00456
TRAWLING Nonmetallic Electrofishing Booms and Accessory Tackle, W79-00069 7B	ULTRAVIOLET RADIATION New Technology: Ozone/UV Chemical Oxida- tion Wastewater Process for Metal Complexes, Organic Species and Disinfection,	URBAN SOCIOLOGY A Comparative Study of Community Response to Water Related Problems, W79-00010 6B
TREATMENT FACILITIES Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota, W79-00102	W79-00369 5D UNDEPLETABLE EXTERNALITIES The Optimal Pricing of Undepletable Externalities, W79-00239 6C	URBAN WATERSHEDS Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knox- ville, Tennessee, W79-00456 5B
Economic Analysis of Selected Features of Municipal Wastewater Construction Grant Legislation, W79-00246 5G	UNGAGED BASINS Simulation of Flows in Ungaged Basins, W79-00331 2E	Preliminary Identification of the Salt Pick-up and Transport Processes in the Price River Basin, Utah,
Cost Estimates for Construction of Publicly- Owned Treatment Facilities, 1974 'Needs' Sur- vey, Final Report to the Congress. W79-00248	UNITED KINGDOM Solid State Event Recorder for Rainfall Measurement, W79-00125 2B	The Historic Level of Great Salt Lake, Utah, W79-00264 2H
TREES Survival and Early Growth of Selected Trees on Waste Water Application Sites,	A Socio-Economic Approach to Water Pollu- tion Law Enforcement in England and Wales, W79-00245	UTILIZATION Cattails (Typha Spp.)—Weed Problem or Potential Crop., W79-00198
W79-00422 SE	UNITED STATES On the Environmental Efficiency of Economic	VALUE Land Prices Substantially Underestimate the
TRICKLING FILTERS Distribution of Heterotrophic and Nitrifying Bacteria Within the Aerobic-Media Trickling	Systems, W79-00230 6G Conceptual and Statistical Issues in Developing	Value of Environmental Quality, W79-00244 6C
Filter, W79-00433 5D	Environmental Measures - Recent U.S. Experience,	VANADIUM Waste Treatment for a Profit, W79-00359 5D
Aerobic Media Trickling Filter Applied to Nitrogen Control, W79-00445 5D	River Temperature Variation with Freezing and Storage,	VAPOR COMPRESSION DISTILLATION Vapor Compression Energy Reduction by Ver-
A Study for Improving the Aerobic-Media Trickling Filter, W79-00457 5D	W79-00477 2E Bathymetry as an Indicator of Net Circulation in Well Mixed Estuaries,	tical Tube Foam Evaporation of Seawater, W79-00015 3A VARIABILITY
TROPHIC LEVEL Nutrient Loading/Lake Trophic Condition	W79-00488 2L UNOX The UNOX Process: Effective Wastewater	Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,
Relationships with Special Reference to the In- fluence of Flushing Rate, W79-00001 5C	Treatment Practice, W79-00347 5D	W79-00113 2B VEGETATION Vegetation of Southeastern Florida Parts II
TROPHIC STATE MODELS Nutrient Loading/Lake Trophic Condition	Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery Wastes,	V, W79-00196 21
Relationships with Special Reference to the In- fluence of Flushing Rate, W79-00001 5C	W79-00348 5D UNOX Wastewater Treatment System Performance Silicone Chemical Complex,	The Productivity of a Range of Blanket Bog Vegetation Types in the Northern Pennines, W79-00202 21
TROPICAL REGIONS Local Differences in the Patterns of Variability of Tropical Rainfall: Some Characteristics and Implications,	W79-00349 5D UNSTEADY FLOW Computing Two-Dimensional Dam-Break	Wet Meadows in Southern Sweden: Vegeta- tion, Succession and Management (In Swedish), W79-00288 21
W79-00113 2B A Storm Rainfal Pattern Above the Central	Flood Waves, W79-00313	VEGETATION STABILIZATION Vegetative Stabilization of Dredge Spoil in
African Plateau, W79-00126 2B	A General Two Dimensional River Simulator, W79-00397 2E UPPER SNAKE RIVER BASIN (IDA)	North Florida, W79-00337 5G
TUNNELS Tunnel Component of the Tunnel and Reservoir Plan Proposed by the Metropolitan Sanita-	The Source of American Falls Reservoir Pollutants, W79-00004	VERMICULITE Formation of a Vermiculite Mineral from Ground Water Components (In Russian), W79-00382 2K
ry District of Greater Chicago, Lower Des Plaines Tunnel System. W79-00465	URBAN DRAINAGE Characterization and Treatment of Stormwater Runoff,	VIRAL RECOVERY RATES B. R. /Hanson ;I. A. /Schipper
TYPE CURVES Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined Anisotropic Aquifers, W79-00136 2F		W79-00150 5C VIRGINIA Nature and Impact of Rural Stream Inputs on Water Quality, W79-00483 5C

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VIRUSES	Case History: Ash Disposal from an Oil Fried	Cost Estimates for Construction of Publicly-
Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water,	Central Station, W79-00361 5E	Owned Treatment Facilities, 1974 'Needs' Survey, Final Report to the Congress.
W79-00148 5C	W19-00223	W79-00248 5G
B. R. /Hanson ; I. A. /Schipper	Pretreatment Land Application of Textile Plant	Westerweler Odor Problem Selving - Diffices
W79-00150 SC	Wastes, W79-00362	Ozone in Water and Waste Water Treatment, A Bibliography, Volume 2.
Application of Ion Exchange/Adsorption	WASTE WATER	W79-00306 5D
Models to Virus Transport in Percolating Beds,	Application of Ion Exchange/Adsorption	Water 1977.
W79-00353 5D	440.4	W79-00342 5D
VISCOUS FLOW	W79-00353 5D	Wester Linguist I. Schillager Active Square
Eddy Production Inside Wall Layers,	A STATE OF THE STA	The UNOX Process: Effective Wastewater
W79-00333	WASTE WATER IRRIGATION Effects of Municipal Sewage Effluent Irriga-	Treatment Practice, W79-00347 5D
VOLUME	tion on the Trace Metal Content of	
A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake	Earthworms, W79-00009 5C	Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery
Bay,	WASTE WATER PURIFICATION	Wastes, W79-00348
W79-00494 2L	Molecular Fractionation by Staged Ultrafiltra-	W79-00348
VORTICES	tion.	. UNOX Wastewater Treatment System Per-
Eddy Production Inside Wall Layers,	W79-00367 5D	formance Silicone Chemical Complex,
W79-00333 8B	THE ACT OF THE PART AND THE PARTY.	W79-00349 7 to 3 5D
	WASTE WATER TREATMENT	Designing and Operating an Oxygen Activated
WAKE TRAILS Eddy Production Inside Wall Layers,	Characterization and Treatment of Stormwater Runoff.	Sludge System Including Tertiary Alum-Mud
W79-00333 8B	W79-00005 5B	Precipitation,
start out on the life services of the services of	, , , , , , , , , , , , , , , , , , , ,	W79-00350 5D
WALES	Method of Disposing of Waste Water Contain-	Pifests of Disselved Owners in the Owners
An Estimate of Annual Runoff from England and Wales, 1728-1976,	ing Emulsified Oil,	Effects of Dissolved Oxygen in the Oxygena- tion Activated Sludge Process,
W79-00124 2E	W79-00020 5D	W79-00351 A sell article sport SD
The second section of the second to the second section of	Treatment of Solids-Liquid-Gas Mixtures,	Or viol amounthcopy prairyndays apparathetys
Water Administration in England and Wales	W79-00022 5D	Dynamics and Control of Suspended Solids in a
Impacts of Reorganization,	Contraction of the Contraction o	Two-Step Activated Sludge Plant,
W79-00384	Treatment of Effluent,	W79-00352 5D
WASHINGTON	W79-00024 5D	Oxygen Activated Sludge Considerations for
Impacts of Impoundment to Vertebrate Animals and their Habitats in the Snake River	Treatment of Lime-Sulfide Tannery Unhairing	Industrial Applications, W79-00354 5D
Canyon, Washington,	Waste, W79-00026	The bill said no the must be be yourself and an
.W79-00146 6G	to the Foliation.	Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants.
Low-Flow Characteristics of Streams on the	Carbon Contact Column, W79-00028 5D	W79-00356 5D
Olympic Peninsula, Washington,	two restate angrama land in whemater	Company with State State of St
W79-00258 2E	Biological Oxidation and Flotation Apparatus	Instrumentation and Controls for Philadelphia
WASOPT METHODOLOGY	and Method,	Electric Company Eddystone Generating Sta-
WASOPT Users Manual: An Integer Pro-	W79-00030 5D	tion Wastewater Treatment System, W79-00357 5D
gramming Methodology for Municipal/Regional	Clarification Process,	Gynt Lyler Dated Street Review Lander
Water Supply Planning, W79-00002 6A	W79-00041 5D	Design Considerations for Wastewater Treat-
W79-00002 6A	profit inval magazati saminauli late i	ment Systems at Existing Fossil Power Plants,
WASTE DILUTION	Color Removal Process,	W79-00358
Sea-Water Neutralization of Effluents from the	W79-00042 5D	Dewatering of Sludges from Oil Fried Electric
Industrial Processing of Phosphorite. A Case	Method for Treating Sewage,	Power Generating Plants,
Study in the Practical Use of Basic Knowledge in Analytical and Marine Chemistry,	W79-00044	W79-00360 5D
W79-00151 5G		New Developments in Oil Language L. Dill
brief Showing Water-Level December 1500	Method for Clarifying Aqueous Waste Liquids	New Developments in Oil Interception by Fil- tration.
Removal of Complex Copper-Ammonia Ions	Containing Acid Dyes, W79-00053	W79-00364 SD
from Aqueous Wastes with Fly Ash,	Constitution of Late Late American Security	Contrade as two varianted for use the filter of o
W79-00155	Activated Sludge System with Staggered Parti-	pH Control Systems Using Carbon Dioxide,
WASTE DISPOSAL	tion Basin,	W79-00365 5D
Effect of Whey Application on Chemical Pro-	W79-00055 5D	Solvent Extraction for Treatment of Waste-
perties of Soils and Crops, W79-00363	Process for Removing Mercury and Mercury	waters from Acetic-Acid Manufacture,
# /9-00303	Salts from Liquid Effluents,	W79-00366 5D
WASTE TREATMENT	W79-00056 5D	Protocolment of Industrial Westernich Co.
Comparison of Complete Mixed Activated	Water Reuse at Highway Rest Areas: Evalua-	Pretreatment of Industrial Wastes with Ozone, W79-00368
Sludge and UNOX Treatment of Brewery Wastes.	tion Phase,	W 79-00368
W79-00348 5D	W79-00087 5D	New Technology: Ozone/UV Chemical Oxida-
J 19 (0.14)	WINDSY WARRANGERSON SATELY	tion Wastewater Process for Metal Complexes,
Treatment of Liquid Wastes from Fossil Fuel	Energy Consumption of Advanced Wastewater	Organic Species and Disinfection, W79-00369
Power Plants,	Treatment at Ely, Minnesota, W79-00102 5D	W /9-00369 5D
W79-00355	Comment of the second of the s	Destruction of Trace Toxic Compounds in
Waste Treatment for a Profit,	Hydrolysis of Iron from Acidic Liquors,	Water and Sludge by Ionizing Radiation,
W79-00359 5D	W79-00228 5D	W79-00370

WASTE WATER TREATMENT

Characterization of Performance of Full-Scale Tertiary Wastewater Granular Media Filters, W79-00371 5D	Ion Selective Electrodes in Water Quality Analysis, W79-00223	How Kind to the Resources is the Grinding Process. (Hyor ressursvennlig er slipeprosessen),
acto out at	on Separate of Common Blanchers Formanismen	W79-00408 3E
Wastewater Odor Problem Solving Process Modification Versus Air Treatment, W79-00373	Water Quality in the Ozark National Scenic Riverways, Missouri, W79-00254 5B	The Closed Mill Concept, W79-00420 3E
Control of Nuisance Odors from Ponds by the Use of Bacteria Cultures, W79-00374	Automated Determination of Selenium in Water,	Residential Water Conservation, W79-00440 3D
Factors Influencing Induced Air Flotation, W79-00375	W79-00261 5A Analyses of Paper Machine Waters with Ion	WATER DEMAND Water/Energy Management and Evaluation Model for Pennsylvania,
Critical Analysis of Flotation Performance,	Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode and Various measurement Methods,	W79-00007 6D
W79-00376 5D Sorption Capabilities of Various Materials for	W79-00429	Point Source Analysis. Inventory, Water Demands, and Problem Area Identification.
Leachate Treatment, W79-00377 5D	WATER AUTHORITIES Water Administration in England and Wales	(Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500. W79-00104 6D
Removal of Fluoborate from Plating Waste- water: Technique and Mecahnism,	Impacts of Reorganization, W79-00384 6E	WATER DISTRIBUTION Water and Land Resource Accomplishments
W79-00378 5D	WATER BALANCE	1975, Statistical Appendix I.
Process for Purifying Aqueous Industrial Effluents.	A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,	W79-00192
W79-00399 5D	W79-00473 2G	A Mathematical Model for Simulating Water
Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the	WATER CHEMISTRY Continuous Standard Water Delivery System	Demand-Supply and Energy Uses for the State of Pennsylvania,
Preparation of Complex Fertilizers (Primenenie	for Bioassays with Aquatic Organisms,	W79-00442 8A
gidroliznogo lignina dłya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya	W79-00073 5A	WATER/ENERGY POLICY A Mathematical Model for Simulating Water
slozhnykh udobrenii), W79-00402	Water Analytical Data as a Tool in Drilling and Production Economics,	Demand-Supply and Energy Uses for the State of Pennsylvania,
Steam Stripping Reduces Condensate at Weyco	W79-00168	W79-00442 8A
Mill, W79-00409	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 1. Chemism of the	WATER/ENERGY SYSTEM A Mathematical Model for Simulating Water
On the Removal of Lignosulfonates and Car-	Rybi Potok Waters and the Chlorophyll Con- tent in Attached Algae and Seston in Relation	Demand-Supply and Energy Uses for the State of Pennsylvania,
bohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von	to the Pollution, W79-00218 5C	W79-00442 8A
Ligninsulfonaten und Kohlenhydraten aus Sul- fitzellstoff-Waschwaessern mittels Aktivkohle).	GP Well Main Xeroster 82000-0797	WATER HARVESTING
W79-00410	Chemistry of Small Norwegian Lakes, with Special Reference to Acid Precipitation,	Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
Process Design Investigations for Alaska Pulp	W79-00321	W79-00474
Mill Wastewater Treatment Facilities, W79-00412 5D	Arcadia Lake Water-Quality Evaluation, W79-00463 5C	Water Harvesting for Afforestation: II. Survival and Growth of Trees,
EPA's Goal for Suspended Solids is Not Met	Total Phosphorus Transport During Storm	W79-00475
with Media Filtration, W79-00414 5D	Events,	WATER HYACINTH Waterhyacinth (Eichhornia Crassipes) Nutrient
Energy Consumption for Electrodialysis of	W79-00478	Uptake and Metabolism in a North Central Florida Marsh,
Spent Sulfite Liquors (Energozatraty na elek- trodializ otrabotannogo shcheloka sul'fitno-	WATER CIRCULATION Generation and Propagation of Downwelling	W79-00206 5C
tsellyuloznogo proizvodstva), W79-00416 5D	Fronts, W79-00128 2H	WATER LEVEL FLUCTUATIONS Maps Showing Water-Level Declines, Land
Clarifier With Suspended Layer of Sediment	Numerical Computation of Three-Dimensional	Subsidence, and Earth Fissures in South-Cen- tral Arizona,
(Osvetlitel' so vzveshennym sloem osadka), W79-00421	Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,	W79-00251 7C
Distribution of Heterotrophic and Nitrifying	W79-00132 2H	Ground-Water Levels in Wyoming, 1977, W79-00259 7C
Bacteria Within the Aerobic-Media Trickling	Regional Response to Forcing in Southern	
Filter, W79-00433	Strait of Georgia, W79-00324 2L	The Historic Level of Great Salt Lake, Utah, W79-00264 2H
Aerobic Media Trickling Filter Applied to	Bathymetry as an Indicator of Net Circulation	WATER LEVELS
Nitrogen Control, W79-00445 5D	in Well Mixed Estuaries,	Use of Dummy Variables in Water Resources Studies,
A Study for Improving the Aerobic-Media	The continue of the same transmit and the same	W79-00114
Trickling Filter,	WATER CONSERVATION Water Reuse at Highway Rest Areas: Evalua-	Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties,
REAL PROPERTY ASSESSMENT ASSESSME	tion Phase,	California,
WATER ANALYSIS Water Analytical Data as a Tool in Drilling and	W79-00087 5D	W79-00253 7C
Production Economics, W79-00168 8G	Soil, Water and Air Sciences Research. W79-00105 2G	Ground-Water Levels in Wyoming, 1977, W79-00259

WATER MANAGEMENT

WATER POLICY

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WATER MANAGEMENT (APPLIED)

Conjunctive Use of Ground and Surface

		WATER POLLUTION TREATMENT
ATER MANAGEMENT	A Study of Coastal Pollution and Agency Inter-	Biocenosis of a High Mountain Stream Under
Point Source Analysis. Inventory, Water Demands, and Problem Area Identification.	face, W79-00389 5G	the Influence of Tourism. 4. The Bottom Fauna
(Areawide Waste Treatment Plan for the	Children of the second and actions of the	of the Stream Rybi Potok (The High Tatra Mts),
Greater Houston Area. Section 208, PL 92-500. W79-00104 6D	Continuous Simulation of Nonpoint Pollution, W79-00493 5B	W79-00221 et . C
ATER MANAGEMENT (APPLIED)	WATER POLLUTION CONTROL	Safety Aspects of Toxic and Hazardous Spills, W79-00345
Conjunctive Use of Ground and Surface Water,	Skimming Apparatus,	179-09040 - 94080-9177
W79-00170 4B	W79-00025	Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against
Water Usage Requires Planning,	Belt Type Oil Removal Unit, W79-00040 5G	Termites, Coptotermes Formosanus Shiraki, in
W79-00183 6D	for Relective PlayTrode's In White County Aced	Kraft Pulping and Bleaching Wastes, W79-00404
Modelling the Water Quality of the Hydrologi-	Apparatus for Deploying and Taking Up an Oil Fence,	Bioassay Results of Kraft Mill Effluent at Ar-
cal Cycle. W79-00379 5B	W79-00048 5G	tificially Elevated Levels of Biosolids,
Water Administration in England and Wales	Method for Depolluting Fresh and Sea Water	W79-00406 5C
Impacts of Reorganization,	from Petroleum Products, W79-00058	A Study of the Fate of Biosolids from Biologi-
W79-00384 6E		cally Treated Effluent in Laboratory and Con- structed Streams,
Management Aspects of Cyclic Storage of Water in Aquifer Systems,	No Water-Source Damage Found in Oil States. W79-00172 5G	W79-00407 5C
W79-00386 4B	What's in the Water, A Look at the Proposed	Biological Evaluation of Acute Toxicity of Selected Finishing Agents (Biologiczna ocena
VATER POLICY	EPA Regulations for Organic Chemicals in	toksyczności ostrej wybranych środkow
Public Outdoor Recreation Benefits of Federal Water Resource Projects.	Public Water Supplies, W79-00179 5F	pomocniczych), W79-00413 5C
W79-00094 6E	A Socio-Economic Approach to Water Pollu-	A CALONDAL STATES
Point Source Analysis. Inventory, Water De-	tion Law Enforcement in England and Wales,	Aquatic Inhabitants of a Mine Waste Stream in Arizona,
mands, and Problem Area Identification. (Areawide Waste Treatment Plan for the	W79-00245 5G	W79-00426 5C
Greater Houston Area. Section 208, PL 92-500.	Development of an Effluent-Free Sulfite Pulp	Hydrochemical Influences on the Fishery
W79-00104 6D	Mill (Entwicklung zur abwasserfrei arbeitenden Sulfitzellstoff-fabrik),	Within the Phosphate Mining Area of Eastern
The National Water Commission Revisited Per-	W79-00424 5D	Idaho, W79-00427
spective on National Water Policy Studies, with some Implications for Changes in Future	WATER POLLUTION EFFECT	WATER POLLUTION SOURCES
Water Policy,	The Biological Effects of Toxic Material Spills,	The Source of American Falls Reservoir Pollu-
W79-00383 6E	W79-00344 5C	tants, W79-00004
A Mathematical Model for Simulating Water Demand-Supply and Energy Uses for the State	WATER POLLUTION EFFECTS Aquatic Biotal Monitor,	
of Pennsylvania,	W79-00033 5A	Environmental Management Strategy for the Great Lakes System.
W79-00442 8A	Fish and Wildlife Inventory of the Seven-Coun-	W79-00084 5G
WATER POLLUTION Applications of Remote Sensing to Hydrologic	ty Region Included in the Central Florida	The Determination of Quantity and Quality of
Planning,	Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,	Great Lakes United States Shoreline Eroded
W79-00099 - COS COLUMN TO THE TOTAL TO THE TOTAL	W79-00100 5C	Material, W79-00249 5B
Pollution of Groundwater Through Nonlinear	Waterhyacinth (Eichhornia Crassipes) Nutrient	
Diffusion, W79-00110 5B	Uptake and Metabolism in a North Central	Water Quality in the Ozark National Scenic Riverways, Missouri,
Literature Review for Explore-I: A River Basin	Florida Marsh, W79-00206 5C	W79-00254 5B
Water Quality Model. Appendix A,	Benthic Algae in a Pond After the Accumula-	A Water Quality Model for the South Platte
W79-00188	tion of Beet-Sugar Factory Wastes,	River Basin, Documentation Report, W79-00398
User's Manual for EXPLORE-I: A River Basin	W79-00216 5C	Translation States Vision There'dli
Water Quality Model. Appendix B, W79-00189 5B	Biocenosis of a High Mountain Stream Under	Continuous Simulation of Nonpoint Pollution, W79-00493 5B
Programmer's Manual for EXPLORE-I: A	Rybi Potok Waters and the Chlorophyll Con-	WATER POLLUTION TREATMENT
River Basin Water Quality. Appendix C, W79-00190 5B	tent in Attached Algae and Seston in Relation to the Pollution.	Method of Disposing of Waste Water Contain-
Path. Bource Assiyas, fictions, Wang to	W79-00218 5C	ing Emulsified Oil, W79-00020 5D
Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-Oc-	Biocenosis of a High Mountain Stream Under	WATER PLREDCATION DONAGE ATVARAGE.
tober 1969.	the Influence of Tourism. 2. Bacteria as an	Treatment of Solids-Liquid-Gas Mixtures, W79-00022 5D
W79-00250 5A	Index of Water Pollution on the Rybi Potok Stream.	Treatment of Effluent,
Water 1977. W79-00342 5D	W79-00219 5C	W79-00024 5D
Modeling and Monitoring of Toxic Spills and	Biocenosis of a High Mountain Stream Under	Skimming Assesses
Toxic Effluents,	the Influence of Tourism. 3. Attached Algae	W79-00025 5G
W79-00343 5B	Communities in the Stream Rybi Potok (The High Tatra Mts, Poland) Polluted with	Treatment of Lime-Sulfide Tannery Unhairing
Stormwater Modeling,	Domestic Sewage,	Waste,
W79-00381 5B	W79-00220 5C	W79-00026 5D

WATER POLLUTION TREATMENT

WATER POLLUTION TREATMENT

		The second of th
Biological Oxidation and Flotation Apparatus and Method, W79-00030	Point Source Analysis. Inventory, Water Demands, and Problem Area Identification.	Ecological System and Method, W79-00021 5G
Oil Fence,	(Areawide Waste Treatment Plan for the Greater Houston Area. Section 208, PL 92-500. W79-00104 6D	Low Molecular Weight Hydrolyzed Polyacryla- mide Used as a Scale Inhibitor in Water
W79-00036 5G Belt Type Oil Removal Unit,	Water Hardness and Cardiovascular Mortality, W79-00171 5C	Systems, W79-00027
W79-00040 5G	Data Base System for State Water Quality	Solid-Fluid Contacting Process, W79-00029 5G
W79-00041 5D	Management Information System. W79-00222 5G	Oil Fence,
Process and Apparatus for Separating Oil From Water Contaminated with Oil,	Ion Selective Electrodes in Water Quality Analysis, W79-00223	W79-00036 Automatic System Cleaner for Remote Moni-
W79-00050 M 12 1 1 1 1 1 1 1 5 6 5 6	W79-00223	tor,
Activated Sludge System with Staggered Partition Basin, W79-00055	Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-Oc- tober 1969.	W79-00051 Literature Review for Explore-I: A River Basin Water Quality Model. Appendix A,
Process for Removing Mercury and Mercury	W79-00250	W79-00188 5B
Salts from Liquid Effluents, W79-00056 5D	Groundwater Quality Atlas of Nebraska, W79-00252	User's Manual for EXPLORE-I: A River Basin Water Quality Model. Appendix B,
Hydrolysis of Iron from Acidic Liquors, W79-00228 5D	Hydrogeologic Reconnaissance of the Mekong Delta in South Vietnam and Cambodia,	W79-00189 5B
The UNOX Process: Effective Wastewater	W79-00255	Programmer's Manual for EXPLORE-I: A River Basin Water Quality. Appendix C,
Treatment Practice,	Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination	W79-00190 5B
W79-00347	Potential in the Silurian Dolomite,	Data Base System for State Water Quality
Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery	W79-00256 5B Water Resources Data for Pennsylvania, Water	Management Information System. W79-00222
Wastes, W79-00348	Year 1977Volume 2. Susquehanna and	The Demand for Clean Water: The Case of the Charles River.
WATER PROPERTIES	Potomac River Basins. W79-00265 7C	W79-00234 a tent model sets will expected and 6B
Arcadia Lake Water-Quality Evaluation, W79-00463 5C	Water Resources Data for Pennsylvania, Water Year 1977Volume 1. Delaware River Basin.	A Water Quality Model for the South Platte River Basin, Documentation Report,
WATER PURIFICATION	W79-00266 7C	W79-00398
Water Filtering and Dispensing Apparatus, W79-00019 5F	Water Resources Data for Wisconsin, Water Year 1977.	WATER QUALITY INDICES Biocenosis of a High Mountain Stream Under
Battery Operated Water Purification System, W79-00043	W79-00267 7C Water Resources Data for Pennsylvania, Water	the Influence of Tourism. 2. Bacteria as an Index of Water Pollution on the Rybi Potok
Water Distiller with Cone Shaped Condenser, W79-00045	Year 1977Volume 3. Ohio River and St. Lawrence River Basins. W79-00268	Stream, W79-00219
Apparatus for Producing High-Purity Water,	Transct Study, Volunce Land II.	WATER QUALITY STANDARDS
W79-00046	Modelling the Water Quality of the Hydrologi- cal Cycle. W79-00379	A Socio-Economic Approach to Water Pollu- tion Law Enforcement in England and Wales, W79-00245 SG
Process for the Treatment of Water Solution by Ion Exchange,	Unitality and Metabolism in a Porth County	United was personal to us a regular and
W79-00054	Transport Characteristics of Phosphorus in Channelized and Meandering Streams, W79-00391 5B	Assessment of the Environmental Impacts on the Ban on Imports of PCBs, W79-00290 5G
Activated Sludge System with Staggered Parti- tion Basin,	Influence of Nitrogen Fertilization on the	MAKER ENLY MAIN TO PART AND MAKEN
W79-00055	Quality and Quantity of Streamflow from a Forested Watershed,	EPA's Goal for Suspended Solids is Not Met with Media Filtration, W79-00414 5D
Desalination Process Using Thermally Regenerable Resins,	W79-00448 5B	The same and the same of the same and the sa
W79-00057 3A	Factors Affecting the Quality of Urban Runoff in Four Watersheds Within the City of Knox-	A Comparative Study of Community Response
The UNOX Process: Effective Wastewater Treatment Practice, W79-00347 5D	ville, Tennessee, W79-00456 5B	to Water Related Problems, W79-00010 6B
Was June 10 - World School	Arcadia Lake Water-Quality Evaluation,	Public Outdoor Recreation Benefits of Federal
WATER PURIFICATION DOSING APPARATUS Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,	W79-00463	Water Resource Projects. W79-00094
W79-00073 5A	Nature and Impact of Rural Stream Inputs on Water Quality, W79-00483 5C	Soil, Water and Air Sciences Research. W79-00105
WATER QUALITY Continuous Standard Water Delivery System	WATER QUALITY CONTROL	Use of Dummy Variables in Water Resources
for Bioassays with Aquatic Organisms, W79-00073 5A	Factors Controlling Variations in River Water Quality in Kansas,	Studies, W79-00114
Environmental Management Strategy for the	W79-00006	Data Base System for State Water Quality
Great Lakes System. W79-00084 5G	Water Filtering and Dispensing Apparatus, W79-00019 5F	Management Information System. W79-00222

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Summary of U.S. Geological Survey Investiga- tions and Hydrologic Conditions in the	WATER SUPPLY DEVELOPMENT	Continuous Electrochemical Synthesis Using a
Southwest Florida Water Management District	New Approach Gets Results in Utah Well, W79-00181 8B	Packed Granular Electrode, W79-00432 5D
for 1977,	W70-00191 10100-07W	
W79-00272 4A	WATER TABLE	WATER USE FUNCTIONS
Lake Level Control and Management-A Case	A Soil Moisture Budget Model Accounting for Shallow Water Table Influences,	Water/Energy Management and Evaluation
Study,	W79-00473	Model for Pennsylvania,
W79-00390 4A	to ment fastest and wietning, Plantan Section berg	W79-00007 6D
WALLAST C. T. T Ortonal v	WATER TEMPERATURE	WATER UTILIZATION
A Mathematical Model for Simulating Water	Adaptations and Resistance to Anoxia in	Point Source Analysis. Inventory, Water De-
Demand-Supply and Energy Uses for the State of Pennsylvania,	Cloeon Dipterum (Ephemeroptera) and Nemou-	mands, and Problem Area Identification.
W70_00442	ra Cinerea (Plecoptera), W79-00076 5G	(Areawide Waste Treatment Plan for the
real following was a state of the	W79-00076 5G	Greater Houston Area. Section 208, PL 92-500.
VATER RESOURCES DEVELOPMENT	Stream Temperature Estimation Using Kalman	W79-00104 6D
Public Outdoor Recreation Benefits of Federal	Filter,	Nerichetton Flaherins Muragementh Discharion
Water Resource Projects. W79-00094 6E	W79-00121 5B	Water Usage Requires Planning, W79-00183
The state of the s	River Temperature Variation with Freezing and	W /9-00163
Optimal Solution to the Timing, Sequencing,	Storage,	WATER VAPOR
and Sizing of Multiple Reservoir Surface Water	W79-00477 2E	Atmospheric Water-Vapor Resources for Rain
Supply Facilities When Demand Depends on	amagicantification of the control of	fall as They are Related to Water Synthesis is
Price,	WATER TREATMENT	Plant Life, Annotated Bibliography.
W79-00438 6A	Water Filtering and Dispensing Apparatus,	W79-00106
WATER REUSE	W79-00019 5F	the brodeline Sense Bearing Street
Water Reuse at Highway Rest Areas: Evalua-	Low Molecular Weight Hydrolyzed Polyacryla-	WATER WELLS
tion Phase,	mide Used as a Scale Inhibitor in Water	Electrical-Resistivity Surveys for Groundwate
W79-00087 5D	Systems,	in the Deccan Trap Country of Sangli District
Reject Stream Replacement Study.	W79-00027 5F	W79-00107
W79-00092	Solid Phyid Contacting Process	uses to the Fishery Institution.
Truthle Mad Itt. to Printelegant And Market Manager	Sond-Finia Contacting Process,	Type-Curve Analysis of Time-Drawdown Dat
Textile Waste Waters: Treatment and Environ-	W79-00029 5G	for Partially Penetrating Wells in Unconfine
mental Effects,	Treatment of Water or Aqueous Systems,	Anisotropic Aquifers,
W79-00166 3E	W79-00039 5F	W79-00136
Water Reuse: A Trickle Becomes a Torrent,	Total and the Control of the Control	Parional Ganlow Series: Burt VII Th
W79-00400 3E	Battery Operated Water Purification System,	Regional Geology Series: Part VII, The Colorado Plateau,
Personal Company of the Assessment of the State of the St	W79-00043 5F	W79-00177
The Closed Mill Concept,	Water Distiller with Cone Shaped Condenser,	Tallmet W
W79-00420 3E	W79-00045 5F	New Approach Gets Results in Utah Well,
WATER SAMPLING .		W79-00181
Simple Sampler Activation and Recording	Apparatus for Producing High-Purity Water, W79-00046	Count Water Date 1001 00 To the Diff.
System,	W/9-00046	Ground-Water Data, 1974-76, Indian Wells Va
W79-00480 7B	Automatic System Cleaner for Remote Moni-	ley, Kern, Inyo, and San Bernardino Countie California.
WATER SOFTENING	tor, The Manual Park and Ing A rose of A rose	W79-00253
Process for the Treatment of Water Solution by	W79-00051 5A	Financia to be a the livery of coast.
Ion Exchange,	Production Westerland Phase because of Ormal	WATER YIELD
W79-00054 5F	Employing Methylene Phosphonates of Oxyal- kylated Polyalkylene Polyamines in Chelation	Ground-Water Data, 1974-76, Indian Wells Va
and the same of th	and/or Scale Inhibition,	ley, Kern, Inyo, and San Bernardino Countie
Water Applytical Data as a Tool in Drilling and	WIGO 00050	California,
Water Analytical Data as a Tool in Drilling and Production Economics,	Day Street Lang Decreases have been all	W79-00253
W79-00168 8G	Process for the Treatment of Water Solution by	WATERSHED MANAGEMENT
	Ion Exchange,	Modeling for Organizational Decision-Makin
WATER STORAGE	W79-00054 5F	Profits vs. Social Values in Resource Manage
Management Aspects of Cyclic Storage of	Desalination Process Using Thermally	ment,
Water in Aquifer Systems,	Daganamble Dagina	W79-00243
W79-00386 4B	W79-00057 3A	Warting B./J
WATER SUPPLY	AT A Black Books Product April 18 P. San	The Application of Linear Programming
Water/Energy Management and Evaluation	Water Treatment: Iron, Boiler Water and	Run-Off Management,
Model for Pennsylvania,	Water Analysis.	W79-00393
W79-00007 6D	W79-00176 5F	Brushland Watershed Fire Management Poli
Point Source Analysis. Inventory, Water De-	What's is the Water A Look at the Deserved	in Southern California: Biosocial Conside
mands, and Problem Area Identification	EPA Regulations for Organic Chemicals in	tions,
(Areawide Waste Treatment Plan for the	Public Water Supplies,	W79-00449
Greater Houston Area. Section 208, PL 92-500.	W79-00179 5F	A STATE AND LESS OF THE PARTY O
W79-00104 6D		WATERSHED MODEL
TRANSPORT OF STATE OF	Bibliography, Volume 2.	A Model for Evaluating the Effect of La
Rural Water Supplies from Laterite Runoff, W79-00387 5F	B 110 5	Uses on Flood Flows,
W79-00387	The second of the second	W79-00450
Residential Water Conservation,	Rural Water Supplies from Laterite Runoff,	WATERSHEDS (BASINS)
W79-00440 3D	W79-00387 5F	Mass Balance Model for Calculation of Ion
Resource Analysis: Water and Energy as	Studies of Ion Exchange and Chelation Com-	Input Loads in Atmospheric Fallout a
Linked Resources,	pounds Adsorbed on Granular Graphite,	Discharge from a Mountainous Basin,
W79-00453 6E		
VI.		

WEATHER FORECASTING

Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model, W79-00468 2B	Water and Land Resource Accomplishments 1975. Summary Report. W79-00191 3F	Methodical Problems in the Evaluation and Mapping of Erosion-Endangered Lands (In Russian), W79-00462
WEATHER MODIFICATION Simulation of Cold Cloud Precipitation in a Three Dimensional Mesoscale Model, W79-00468 2B	WET SEASONS Potentiometric Surface Map of the Floridan Aquifer in the St. Johns River Water Manage- ment District and Vicinity, Florida, September, 1977.	WISCONSIN Water Resources Data for Wisconsin, Water Year 1977.
WELFARE (ECONOMICS) Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion, W79-00231 6B	W79-00275 WETLANDS Summary of Study Findings, Phase I Report: Ecological Effects of Highway Construction	WOOD WASTES Collecting Bark Burner Ash with Electrostatic Precipitators,
Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion (Anderson),	Upon Michigan Woodlots and Wetlands, W79-00195	WYOMING Ground-Water Levels in Wyoming, 1977,
W79-00235 6E	Wetlands as a Naval Environmental Concern,	W79-00259 7C
Distributional Implications of the Extended Economic Zone: Some Policy and Research Is- sues in the Fishery, W79-00236 6E	W79-00201 6G WHEAT Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthes-	YELLOWSTONE NATIONAL PARK Yellowstone National Park Survey May-August 1970, Includes Soda Butte Survey, May-October 1969. W79-00250
Distributional Implications of Extended Fisheries Jurisdiction: Some Research and Policy Issues: Discussion,	is, (In Russian), W79-00200 2I WHEY	YELLOWSTONE RIVER Yellowstone National Park Survey May-Augus
W79-00237 6E Distributional Implications of the Extended	Effect of Whey Application on Chemical Pro- perties of Soils and Crops,	1970, Includes Soda Butte Survey, May-October 1969.
Economic Zone: Some Policy and Research Is-	W79-00363 5E	W79-00250
sues in the Fishery: Discussion, W79-00238 6E Constraints to Welfare Gains Under Extended	WHITE AMUR Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur	ZIMOWY WIELKI POND (POLAND) Benthic Algae in a Pond After the Accumulation of Beet-Sugar Factory Wastes,
Jurisdiction Fisheries Management, W79-00240 6E	into Water Bodies, (In Russian), W79-00207	W79-00216 50 ZIZANIA AQUATICA VAR. AQUATICA
WELL DESIGN	WILD BROOK TROUT	Growth, Mortality, and Biomass Partitioning is
Water Well Development Decisions, W79-00167 8B	Genetic and Environmental Factors Involved in Increased Resistance of Brook Trout to Sul- furic Acid Solutions and Mine Acid Polluted	Freshwater Tidal Wetland Populations of Wil Rice (Zizania Aquatica Var. Aquatica), W79-00214
WELL DEVELOPMENT Water Well Development Decisions, W79-00167 8B	Waters, W79-00458 5C	ZOOPLANKTON Nonmetallic Electrofishing Booms and Access
Ber alle Wagner of The Control Committee Workshop Co.	WILD RICE Growth, Mortality, and Biomass Partitioning in	sory Tackle, W79-00069
WELL POINTS Well Point Systems. W79-00182 8C	Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica), W79-00214 SC	AND STATE OF THE S
WELL SCREENS Water Well Development Decisions, W79-00167 8B	WILD RIVER ACT Protection of Outdoor Recreation Values of Rivers.	Control of the contro
Efficiency of Screenless Wells for Irrigation, W79-00184	W79-00093 6B	
WELLINGTON RESERVOIR (WESTERN AUSTRALIA)	WILD RIVERS Protection of Outdoor Recreation Values of Rivers.	
Field Investigation of Selective Withdrawal, W79-00119 4A	W79-00093 6B	
WELLS Digital Model Studies of Unsteady-State Radial Flow to Partially Penetrating Wells in Uncon- fined Anisotropic Aquifers,	Water Quality in the Ozark National Scenic Riverways, Missouri, W79-00254 5B	
W79-00111 2F Efficiency of Screenless Wells for Irrigation,	Fish and Wildlife Inventory of the Seven-Coun- ty Region Included in the Central Florida Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,	
Functions and Properties of Drilling Mud.	W79-00100 5C	
W79-00186 8G	WILLINGNESS TO PAY The Demand for Clean Water: The Case of the	Con the same of English Con the Englis
WEST INDIES Flood Regions in Jamaica,	Charles River, W79-00234 6B	
W79-00330 2E	WINDS	
WESTERN AUSTRALIA Field Investigation of Selective Withdrawal, W79-00119 4A	Generation and Propagation of Downwelling Fronts,	
W79-00119	W79-00128 2H	March March March Constraint

AUTHOR INDEX

on and ds (In

Water 7C rostatic

, 7C

August

-August lay-Oc-

cumula-

oning in of Wild

Acces-

STATE OF STA

CERASUSTICITER, A. C. S. S. S. S.	Wester Baywering for Affordaylog all a force	DERKE W. CHECKE WAS A CONTRACTOR OF THE CONTRACT
ACKERSON, R. C.	ARMSTRONG, J. M.	BARR, L. R.
Stomatal and Nonstomatal Regulation of Water	The Determination of Quantity and Quality of	Water Administration in England and Wales
Use in Cotton, Corn and Sorghum,	Great Lakes United States Shoreline Eroded	Impacts of Reorganization,
W79-00016 2I	Material,	W79-00384 6E
Water Relations and Physiological Activity of	W79-00249	BARRIOTA TO THE STATE OF THE ST
Potatoes.	ARNOW, T.	BARRETT, J. H. Desalination Process Using Thermally
W79-00017	The Historic Level of Great Salt Lake, Utah,	Desalination Process Using Thermally Regenerable Resins,
PARESSIN ACCOUNT TAXE IN DUBLICATION	W79-00264 2H	11/20 00047
ADAMS, C. E. JR.	ST CARROLAL W	W 79-00037
Oxygen Activated Sludge Considerations for	ASHBY, J.	BARTON, C. A.
Industrial Applications,	Our Reclamation Future: The Missing Bet on Trees,	EPA's Goal for Suspended Solids is Not Met
W79-00354 5D	W79-00086 4C	with Media Filtration,
ALDRICH, A.	IVOLTON Waters and the Chamball Can	W79-00414 5D
The Toxicity of Phthalates to the Marine	ASHBY, W. C.	China a manufactura and a contraction of the
Dinoflagellate Gymnodinium Breve,	Our Reclamation Future: The Missing Bet on	BASAK, P.
W79-00063 5C	Trees,	Pollution of Groundwater Through Nonlinear
Silver Continue V & Model of Australia	W79-00086 4C	Diffusion, W79-00110 5B
ALEKSEEVA, T. L.	ASKEROV, T. A.	AND A CHARLES TOWN OF THE PROPERTY OF THE PARTY OF THE PA
Effect of Environmental Factors on the Dis-	Survival and Oxygen Consumption of Young	BASKETT, R. C.
tribution of Caddis Fly Larvae in Small Rivers	Kura Carp Under Various Keeping Conditions	A Method of Measuring Bacterial Growth in
(In Russian), W79-00147	(In Russian),	Aquatic Environments Using Dialysis Culture,
W79-00147	W79-00180 2H	W79-00109 5A
ALEXANDER, C. L.	400000 B 31.8 303008 C	depolated and philosophics, and laws a value
The Determination of Quantity and Quality of	ASKEIR, P.	BATEMAN, S. T.
Great Lakes United States Shoreline Eroded	Studies in Microbial Chemotactic Behavior in	Increased Product Water Recovery by Reverse
Material,	Seawater, W79-00293	Osmosis Using Interstage Ion Exchange Soft-
W79-00249 5B	W 79-00293	ing and a Spiractor,
With countries of the same of the same of the same of	AUSTIN, D. F.	W79-00301 3A
ALEXANDER, M.	Vegetation of Southeastern Florida Parts II -	BATTALING T. P.
Microbial Degradation of DDT,	V. 1000	BATTALINO, T. E. Electric Rainfall Intensity Sensor,
W79-00278	W79-00196 21	
ANDERSON, C. L.	DARAPU M D	W79-00329 2B
Hydraulic Model Investigation of a Two-Way	BABAEV, M. P. Irrigated Soils of the Milskaya Plain (In Rus-	BATU, V.
Drop Inlet for Floodwater Retarding Structure	sian),	Steady Infiltration from Single and Periodic
No. 3, Banklick Creek Watershed, Boone and	W79.00060	Strip Sources,
Kenton Counties, Kentucky,	despite the state of the state	W79-00471 2G
W79-00341 8B	BACA, R. G.	
ANDREGAN II I	Literature Review for Explore-I: A River Basin	BAYAZIT, M.
ANDERSON, H. R. Hydrogeologic Reconnaissance of the Mekong	Water Quality Model. Appendix A,	Scour of Bed Material in Very Rough Chan-
Delta in South Vietnam and Cambodia.	W79-00188 5B	nels,
W79-00255 7C	Programmer's Manual for EXPLORE-I: A	W79-00122
W 77-00255 .	River Basin Water Quality. Appendix C,	BEALE, J. H.
ANDERSON, J. E.	W79-00190 5B	Laboratory Studies on Advanced Composite H
Remote Monitoring of Coal Strip Mine Reha-	Planting To the second of	F Modules for Seawater Reverse Osmosis,
bilitation,	User's Manual for EXPLORE-I: A River Basin	W79-00300 3A
W79-00226 5G	Water Quality Model. Appendix B,	Stilletall Forestrates for the Towner Guill Collect
ANDRESON V S	W79-00189 5B	BECK, G. J.
ANDERSON, K. B. Musculium Transversum in the Illinois River	A Water Quality Model for the South Platte	Instrumentation and Controls for Philadelphia
and an Acute Potassium Bioassay Method for	River Basin, Documentation Report,	Electric Company Eddystone Generating Sta-
the Species.	W79-00398 and man 12 has seed to 3B	tion Wastewater Treatment System,
W70 00443	stracted Streams * Estable N	W79-00357
W/9-00443	BAKER, K. S.	Citionals-Biver and Major Tribunging to Crand a
ANDERSON, L. G.	Optical Classification of Natural Waters, W79-00318 2L	BELL, B. A. Comparison of Complete Mixed Activated
Constraints to Welfare Gains Under Extended	W79-00318 2L	Sludge and UNOX Treatment of Brewery
Jurisdiction Fisheries Management: Discussion	BALEK, J.	Wastes.
(Anderson),	A Storm Rainfal Pattern Above the Central	W79-00348 5D
W79-00235 6E	African Plateau,	Cartesian and the control of the control of
ARIAS, E.	W79-00126 2B	BEN-ASHER, J.
The Toxicity of Manganese Ethylenebisdithic-	BARKER, J. C.	Determination of Terrestrial Albedo from
carbamate to the Adult Newt, Triturus	Simple Sampler Activation and Recording	LANDSAT I Satellite Imagery in Photographic
Cristatus,	System,	Form,
W79-00064 5C	W79-00480 7B	W79-00012 7B
	3.0.23.0008	BENNETT I F
ARMBRUSTER, J. T.	BARKO, J. W.	BENNETT, J. E. On-Site Generation of Hypochlorite Solutions
Model of the Flooding Caused by the Failure of	An Investigation of Primary Production and	by Electrolysis of Seawater,
the Laurel Run Reservoir Dam, July 19-20,	Ecosystem Metabolism in a Lake Michigan	W70.00272 CE
1977, near Johnstown, Pennsylvania,	Dune Pond, W79-00205 5C	J. J
W79-00263 2E	W79-00205 5C	BERGER, H. F.
ARMSTRONG, D. A.	BARKS, J. H.	Investigation of Factors Affecting BOD Mea-
Toxicity of the Fungicide Captan to the Dunge-	Water Quality in the Ozark National Scenic	
ness Crab Cancer Magister.	Riverways, Missouri,	Test and sloter A in the hour bits via
W79-00065 5C	W79-00254 5B	W79-00405 5A

COCHIAM BURNES

BERKS, R.	Water Harvesting for Afforestation: II. Sur-	BRANDSTETTER, A.
Photosynthesis and Carbon Metabolism in	vival and Growth of Trees,	Literature Review for Explore-I: A River Basin
Marine and Freshwater Diatoms,	16 W79-00475 15 16 16 16 16 16 16 1	Water Quality Model. Appendix A,
W79-00208	BOCOMOLOW V	W79-00188
18C00-64.M. 511	BOGOMOLOV, Y.	Programmer's Manual for EXPLORE-I: A
BERRY, R. S.	Efficiency of Screenless Wells for Irrigation,	River Basin Water Quality. Appendix C,
Resource Analysis: Water and Energy as	W79-00184 3F	W79-00190 5B
Linked Resources,	BOLTE, W. B.	the Marier Manager of the State Con State of the Control of the Co
W79-00453 6D	Water Distiller with Cone Shaped Condenser,	User's Manual for EXPLORE-I: A River Basin
BERRYHILL, D. L.	the state of the s	Water Quality Model. Appendix B,
	W79-00045 5F	W79-00189 phate belavitan above 5B
Membrane Concentration of Infectious Bovine	BOMBOWNA, M.	
Rhinotracheitis Virus from Water, W79-00148	Biocenosis of a High Mountain Stream Under	BREITENBECK, G. A.
W79-00148 SC	the Influence of Tourism. 1. Chemism of the	Vegetative Stabilization of Dredge Spoil in
BEVER, T. D.	Rybi Potok Waters and the Chlorophyll Con-	North Florida,
CANDON CLASS OF PUREL AFRAGE STREET, ASSESSED.		W79-00337
Energy Conservation and Outdoor Recreation,	tent in Attached Algae and Seston in Relation	No Continue of the liberty of and a feet for the
W79-00096	to the Pollution, W79-00218 5C	BREITNER, N. F.
BIRMINGHAM, A.	W79-00218	Continuous Culture of Marine Diatoms Under
	BONNICKSEN, T. M.	Silicon Limitation. 3. A Model of Si-Limited
Regional Electric Energy Planning: A Case		Diatom Growth,
Study in the Politics of Scarce Resources,	Brushland Watershed Fire Management Policy	W79-00229 5C
W79-00144 6E	in Southern California: Biosocial Considera-	BRANCH AND THE STATE OF THE STA
BICKNER C D THE COMMON AND A	tions,	BRENMAN, J. E.
BISKNER, C. D.	W79-00449 6B	Treatment of Liquid Wastes from Fossil Fuel
EPA's Goal for Suspended Solids is Not Met	BOOVED D P	Power Plants, W79-00355
with Media Filtration,	BOOKER, R. E.	W79-00355 5D
W79-00414	Ground-Water Availability in the Hitchcock-	BRENNIMAN, G. R.
CASCOLORUS CONTRACTOR OF THE C	Red Willow, Frenchman Valley, and Meeker-	
BISZ-KONARZEWSKA, A.	Driftwood Irrigation Districts, Southwest	Determination of Chrysotile Asbestos in Rain-
The Effect of Cyclohexane Derivatives on	Nebraska,	water,
Selection of Bacterial Groups Forming Ac-	W79-00260 4B	W79-00014 5A
tivated Sludge Microflora,	Vegetaries of Southwares Fill dis Field 11	BROMLEY, D. W.
W79-00159 5D	BOONE, R. D.	
	Two-Step Roll Ahead Irrigation System,	Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-
BLAIR, S. H.	W79-00032	
Rainfall Frequencies for the Persian Gulf Coast	VINTARA N. C	sues in the Fishery,
of Iran,	BOOTH, G. M.	W79-00236 6E
W79-00123 2B	Uptake and FAte of DI-2-Ethylhexyl Phthalate	
	in Aquatic Organisms and in a Model	Property Rules, Liability Rules, and Environ- mental Economics.
BLANCHARD, D. C.	Ecosystem,	
Seven Problems in Bubble and Jet Drop	W70 00061 CD	W79-00241 6E
Researchers.	HITTHER MANNEY IT STORTED FOR SOME MANNEY SEL	BROOKMAN, G. T.
W79-00319 8B	BORNE, B. J.	Sampling and Modeling of Non-Point Sources
96,34.00.101.	Textile Waste Waters: Treatment and Environ-	at a Coal-Fired Utility,
BLEDSOE, D. R.	mental Effects,	W79-00279 5B
Development of a Manometric Fish Bioassay	W79-00166 3E	W 19-00219
Technique for Water Pollution,	era Elem Dissaroli Amerikan Yan Auruntinduer W	Wastewater Odor Problem Solving Process
W79-00008 5A	BORSETTI, A. P.	Modification Versus Air Treatment,
P. Modobia (or Franchis Marerre, Capicale,	Identification of Kepone Alteration Products in	W79-00373 5D
BLEEK, J. M.	Soil and Mullet, Andrew State Ward	117-00373 A5500-951#
Rainfall Frequencies for the Persian Gulf Coast	W79-00080 STATES 5A	BROWN, R. S.
of Iran,	W 17-00000	Factors Affecting the Quality of Urban Runoff
W79-00123 2B	BORTON, D. L.	in Four Watersheds Within the City of Knox-
W 79-00123 2B	A Study of the Fate of Biosolids from Biologi-	ville, Tennessee,
BLINN, D. W.	cally Treated Effluent in Laboratory and Con-	W79-00456 5B
A Periphytic Microflora Analysis of the	structed Streams,	W79-00456 A Company and 5B
Colorado River and Major Tributaries in Grand	W79-00407 5C	BRTKO, W. J.
	W/9-0040/	Transfer of Gases at Natural Air-Water Inter-
Canyon and Vicinity, W79-00285	BOSCAK, V. G.	faces,
W79-00285	Wastewater Odor Problem Solving Process	W79-00127 2L
		and reported a second transfer and the second secon
BLIVEN, L. Nature and Impact of Rural Stream Inputs on	Modification Versus Air Treatment,	BRUCH, J. C. JR.
	W79-00373 5D	Free-Surface Seepage Problem,
Water Quality.	BOSE, R. N.	W79-00496
W79-00483 5C		NAME.
Provenienting of Terrestal Alleste Venient	Electrical-Resistivity Surveys for Groundwater	BRUNSDON, G. P.
BLOCK, C. S.	in the Deccan Trap Country of Sangli District,	Solid State Event Recorder for Rainfall Mea-
Activated Sludge System with Staggered Parti-	Maharashtra,	surement,
tion Basin,	W79-00107 4B	W79-00125 2B
W79-00055 5D		
BLOCK I	BOWLES, D. S.	BUCHANAN, D. U.
BLOCK, J.	Preliminary Identification of the Salt Pick-up	Toxicity of the Fungicide Captan to the Dunge-
Development of Low Cost Membrane Cleaning	and Transport Processes in the Price River	ness Crab Cancer Magister,
Agents,	Basin, Utah,	W79-00065 When a 1 and we do I we 191 5C
W79-00304 3A	W79-00145 3C	W79-80363
MARCHARA C.		BUGAKOVA, A. N.
BOERSMA, L.	BRADFORD, J. D.	Effect of Sulfur Deficiency on Water Regime
Water Harvesting for Afforestation: I. Efficien-	Icebreaking Capability of CCGS 'Labrador' in	and Intensity of Pea and Wheat Photosynthes-
cy and Life Span of Asphalt Cover,	Western Barrow Strait, October 23-28, 1973,	is, (In Russian), https://doi.org/10.100/
W79-00474 3B	W79-00090 2C	W79-00200 21

Basin

1: A 5B

Basin 5B

oil in

Under imited

Fuel 5D

Rain-

tended reh Is-6E

6E ources 5B rocess

Runoff Knox-

Inter-2L

8D

1 Mea-2B Dunge-5C

Regime ynthes-21

The state of the s		
BUMP, R. L.	CAPODANNO, G. CHARLE WAS IN THE WAR BONT	CHANDRASHEKAR, M.
Collecting Bark Burner Ash with Electrostatic Precipitators,	The Toxicity of Manganese Ethylenebisdithic- carbamate to the Adult Newt, Triturus	A General Two Dimensional River Simulator, W79-00397 2E
W79-00163	Cristatus,	CHAPPELL, C. F.
BUONO, A.	m tale agreement interest outlines.	Simulation of Cold Cloud Precipitation in a
Summary of U.S. Geological Survey Investiga- tions and Hydrologic Conditions in the	CARON, A. L. Bioassay Results of Kraft Mill Effluent at Ar-	Three Dimensional Mesoscale Model, W79-00468 2B
Southwest Florida Water Management District	tificially Elevated Levels of Biosolids,	CHARNELL, R. L.
for 1977, W79-00272	W79-00406	Regional Response to Forcing in Southern
The Philosysthetic and Respiratory Esterage	CARPENTER, V.	Strait of Georgia,
BURGES, S. J. Climate Change: Detection and Its Impact on	The Toxicity of Phthalates to the Marine Dinoflagellate Gymnodinium Breve.	W79-00324 21.
Hydrologic Design, W79-00492 2E	W79-00063 5C	CHAUDHURI, H. Control of Aquatic Weed by Moth Larvae.
H.M.RFAAR	CARPENTER, W. L.	W79-00197
Conjunctive Use of Ground and Surface Water,	Investigation of Factors Affecting BOD Mea- surement and Experience with the 1-Day BOD	CHEN, E. H. Determination of Chrysotile Asbestos in Rain-
W79-00170 W Assumed to be W free dealed many 4B	Test, W79-00405 5A	water, value or w
BURGESS, T.	Officers I have been been been a supply to	W79-00014 5A
Nekoosa Cleans Condensates with Steam Distillation,	CARR, J. C.	Is Chrysotile Asbestos Released from
W79-00162 5D	A Model for Evaluating the Effect of Land Uses on Flood Flows.	W79-00013 5A
BURKHARDT, C. W.	W79-00450 4C	CHEN, M. S.
Factors Influencing Induced Air Flotation,	CARTEE, C. P.	Activated Sludge System with Staggered Parti-
W79-00375	A Study of Coastal Pollution and Agency Inter- face.	tion Basin,
BURROWS, J.	W79-00389 5G	W79-00055 5D
Treatment of Water or Aqueous Systems, W79-00039	CARTWRIGHT, K.	CHEREMISINOFF, P. N.
Extra-Diagnization and The Call Walling St.	Geologic Studies to Identify the Source for	Oil/Water Separation Technology: The Options Available - Part 2.
BURRUSS, R. P. JR.	High Levels of Radium and Barium in Illinois	W79-00158 3G
Assessment of the Environmental Impacts on the Ban on Imports of PCBs,	Ground-Water Supplies: A Preliminary Report, W79-00063	CHET, I.
W79-00290 5G	0.4 (11411.15)	Studies in Microbial Chemotactic Behavior in
BURTON, R. A.	CASCIANO, R. M.	Scawater,
UNOX Wastewater Treatment System Per-	pH Control Systems Using Carbon Dioxide, W79-00365 5D	W79-00293
formance Silicone Chemical Complex,	34 Apply to the relation of the pathway William	CHIU, C. L.
W79-00349 5D	CASHMAN, P. M. Groundwater Pumping Techniques for Excava-	Stream Temperature Estimation Using Kalman Filter,
BURTON, R. E.	tions and Other Works,	W79-00121 5B
Ecological System and Method, W79-00021 5G	W79-00185	Three-Dimensional Open Channel Flow,
Mark Take Rith Milder of Aus Regulation	CASTRUCCIO, P.	W79-00312 8B
BUSH, S. W. The Closed Mill Concept,	Applications of Remote Sensing to Hydrologic	CHOI, P. M. K.
W79-00420	Planning, W79-00099	Acute and Chronic Oral Toxicity of Chl-
BUSS, I. O.	section Action that I hadon I correct control to	roinated Dibenzofurans to Salmonid Fishes, W79-00062
Impacts of Impoundment to Vertebrate	CAUSSEAUX, K. W. Summary of U.S. Geological Survey Investiga-	CONTRACTABLE
Animals and their Habitats in the Snake River	tions and Hydrologic Conditions in the	CHU, T-Y.
Canyon, Washington,	Southwest Florida Water Management District	Removal of Complex Copper-Ammonia Ions from Aqueous Wastes with Fly Ash.
W79-00146 2 LISW 1 STORES A STORES 6G	for 1977, W79-00272	W79-00155 5D
CAGNATI, V. N.	TO SHAME AND THE AND THE PROPERTY OF THE PARTY OF THE PAR	CHURSCHILL, R. J.
Removal of Fluoborate from Plating Waste- water: Technique and Mecahnism,	CEARLOCK, D. B. Literature Review for Explore-I: A River Basin	Critical Analysis of Flotation Performance,
W79-00378	Water Quality Model. Appendix A,	W79-00376 5D
CAHN, R. P.	W79-00188 5B	CLEM, A. G.
Removal of Ammonium Sulfide from Waste-	Programmer's Manual for EXPLORE-I: A	Method and Composition for Preventing Water Contaminated with Industrial Waste Sceping
water by Liquid Membrane Process,	River Basin Water Quality. Appendix C.	Through Soil Containing Said Water.
W79-00161 5D	W79-00190	W79-00034 5G
CAIN, G.	User's Manual for EXPLORE-I: A River Basin	CLEMENS, D. H.
Stabilization of Earth Subsurface Layers, W79-00035	Water Quality Model. Appendix B. W79-00189 5B	Desalination Process Using Thermally
	JANS FOR REER, V. H.	Regenerable Resins. W79-00057
CALDWELL, K. S.	CHADWICK, D. G. Preliminary Identification of the Salt Pick-up	JR 24 1901 F
ness Crab Cancer Magister, W79-00065 5C	and Transport Processes in the Price River	CLYDE, G. WASOPT Users Manual: An Integer Pro-
W79-00065 5C	Basin, Utah,	gramming Methodology for Municipal/Regional
CALF, G. E.	W79-00145	Water Supply Planning, W79-00002
The Isotope Hydrology of the Mercenie Sand-	CHAN, P.	BOTHSON, P. B
stone Aquifer, Alice Springs, Northern Territo-	Sorption Capabilities of Various Materials for Leachate Treatment.	COCHRAN, C. L.
ry, Australia, W79-00322 2F	W79-00377 5D	Wetlands as a Naval Environmental Concern, W79-00201 60

AUTHOR INDEX

COHEN, A. L.	tion Rates of Liver Tissues of Three Fish Spe-	DAVIS, C. O.
Belt Type Oil Removal Unit,	cies,	Continuous Culture of Marine Diatoms Under
W79-00040	W79-00454	Silicon Limitation. 3. A Model of Si-Limited
COKER, R. D.	COULTAS, C. L.	Diatom Growth,
Isotopic Composition of Sulfur in Precipitation	Vegetative Stabilization of Dredge Spoil in	W79-00229 5C
Within the Great Lakes Basin,	North Florida,	DAVIS, J. C
W79-00339		Water Reuse: A Trickle Becomes a Torrent,
W (Sample)	W79-00337	
COLE, C. R.	CREMEANS, J. E.	W79-00400 and interest them 115 online 3E
Literature Review for Explore-I: A River Basin	Conceptual and Statistical Issues in Developing	DAVIS, M. A.
Water Quality Model. Appendix A.	Environmental Measures - Recent U.S. Ex-	The Photosynthetic and Respiratory Rates and
W79-00188 5B	perience, and define the state of the state	Tolerances of Benthic Algae from a Mangrove
	W79-00232	and Salt Marsh Estuary: A Comparative Study,
Programmer's Manual for EXPLORE-I: A	hes influence of former Charles of the work	W79-00204 .neited Carello Lett 5C
River Basin Water Quality. Appendix C.	CREWS, R. C.	Wits days
W79-00190 5B	Species Diversity Indices of the Fish Popula-	DAVIS, P. B.
	tions of Streams Draining Selected Test Areas	Summary of Study Findings, Phase I Report:
User's Manual for EXPLORE-I: A River Basin	on Eglin Air Force Base Reservation Florida,	Ecological Effects of Highway Construction
Water Quality Model. Appendix B.	W79-00277 7C	Upon Michigan Woodlots and Wetlands,
W79-00189 5B	WHICKSEN, T. O. P.SHOPEW	W79-00195 4C
A Water Quality Model for the South Platte	CRISP, M.	
	Effects of Feeding and of Chemical Stimulation	DAVIS, R. B.
River Basin, Documentation Report, W79-00398	on the Oxygen Uptake of Nassarius Reticulatus	Laboratory Studies on Advanced Composite H
W79-00398	(Gastropoda: Prosobranchia),	F Modules for Seawater Reverse Osmosis,
COLEMAN-MAROIS, K.	W79-00083 5C	W79-00300
Vegetation of Southeastern Florida Parts II -	KYKEN, II, R.	142,111.24.34.00
V.	CROLEY, T. E. II	DAVIS, S. N.
W79-00196	Wet Cooling Tower Backfitting Economics,	Tracing Sewage Effluent Recharge - Tucson,
W 79-00196	W79-00233	Arizona,
COLEMAN, W. D.	William Annual Man	W79-00299
Destruction of Trace Toxic Compounds in	CRONIN, E. A.	Sanday's sincerific to 12 to 1
	Report of a Dematiaceous Hyphomycete from	DAWES, C. J.
Water and Sludge by Ionizing Radiation,	the Great Salt Lake, Utah,	The Photosynthetic and Respiratory Rates and
W79-00370 5D	CONTRACTOR CONTRACTOR OF THE C	Tolerances of Benthic Algae from a Mangrove
COLTHARP, G. B.	"On 100 M. Salette contrata in the School and a semiliary seed	and Salt Marsh Estuary: A Comparative Study,
Influence of Nitrogen Fertilization on the	CURRIE, P. O.	W79-00204 5C
	Grazing and Logging Effects on Soil Surface	A SERVICE STREET, STRE
Quality and Quantity of Streamflow from a		DAY, T. J.
Forested Watershed, W79-00448 - 5B	Changes in Central Colorado's Ponderosa Pine	Longitudinal Dispersion of Fluid Particles in
BOOK AND	Type. W79-00140 4C	Mountain Streams: I. Theory and Field
CONEWAY, C. R.	CASHATAN, N. M.	Evidence, Parts of W
Dynamics and Control of Suspended Solids in a	CZARNECKI, D. B.	W79-00308 5B
Two-Step Activated Sludge Plant,	A Periphytic Microflora Analysis of the	HURIDS, N. E O
and the second s		Longitudinal Dispersion of Fluid Particles in
W79-00352 5D	Colorado River and Major Tributaries in Grand	Mountain Streams: 2. Similarity of the Mean
CONKLIN, P. J.	Canyon and Vicinity, W79-00285	Motion and Its Application,
Toxicity of Sodium Pentachlorophenate (NA-	photostyll of phone Scrame II by section A	W79-00309 5B
PCP) to the Grass Shrimp, Palaemonetes Pugio.	D'ANTONI, J. M.	The Closed Multiple and the second and the
at Different Stages of the Molt Cycle.	Effects of Dissolved Oxygen in the Oxygena-	DE BRUIN, H. A. R.
W79-00078 5C		A Simple Model for Shallow Lake Evapora-
The second secon	tion Activated Sludge Process,	tion,
CONTRACTOR, D. N.	W79-00351 5D	W79-00326 2D
A Model for Evaluating the Effect of Land	DADDIO, E.	Anisothy Sand Harland Research on the Hagilan March
Uses on Flood Flows,		DE LA CRUZ, A. A.
W79-00450 4C	Inertial Currents Over the Inner Shelf Near 30	Changes in Interstitial Water Salinity of a Mis-
ACTION AND ASSESSMENT OF THE PARTY OF THE PA	Degree N.	sissippi Tidal Marsh,
СООК, Р. М.	W79-00133 . 2L.	W79-00338 2L
Asbestos - A Bibliography.	DATE B P	Constitution of the Light Country of the Light Coun
W79-00225 5A	DALE, R. F.	DEBLER, W. Hard Say M. Mad Salphin as V. Walley
The state of the s	A Soil Moisture Budget Model Accounting for	Pipe Sizes from Modified Moody Diagram,
COOLEY, J. H.	Shallow Water Table Influences,	W79-00499 3F
Survival and Early Growth of Selected Trees	W79-00473 2G	TARK II P
on Waste Water Application Sites,	Programmer's Alement for E.C.P. C.M. C. A.	DECARLO, V. J.
W79-00422	DALRYMPLE, R. W.	Multimedia LevelsMercury,
Learner of the control of the contro	Bedforms and Their Hydraulic Stability Rela-	W79-00291 5B
COPLAN, M. J.	tionships in a Tidal Environment, Bay of	
Laboratory Studies on Advanced Composite H	Fundy, Canada,	DEGEN, L.
F Modules for Seawater Reverse Osmosis.	W79-00336 2L	Method for Depolluting Fresh and Sea Water
W79-00300 2012-1-1-1-1-3A		from Petroleum Products,
ACCORDANCE IN CROOLING IN	DANZBERGER, A. H.	W79-00058
COSTA, H.	New Developments in Oil Interception by Fil-	A LANGE OF THE PARTY OF THE PAR
A Study of the Fate of Biosolids from Biologi-	tration.	DELHOMME, J. P.
cally Treated Effluent in Laboratory and Con-	W79-00364 5D	Kriging in the Hydrosciences,
structed Streams.	WTHATAN TO THE THE PARTY OF THE	W79-00134 21
W79-00407	DAVENPORT, J.	TARREST A NO. OF THE PARTY OF T
todays w	Effects of Feeding and of Chemical Stimulation	DENDY, F. E.
COTHRON, P. D.	on the Oxygen Uptake of Nassarius Reticulatus	Control of Water Residence Time in Smal
A Comparative In Vitro Study of the Effects of	(Gastropoda: Prosobranchia),	Reservoirs,
Various Balanced Saline Solutions on Respira-	W79-00083	W79-00482
Table 1	the state of the s	12 14 14 14 14 14 14 14 14 14 14 14 14 14

ns Under i-Limited 5C

rrent,

Rates and Mangrove ve Study, 5C

I Report: nstruction ds, 4C

mposite H

- Tucson,

Rates and Mangrove ive Study, 5C

articles in and Field

earticles in the Mean 5B Evapora-2D

y of a Mis-2L

agram. 3F

Sea Water

Sewel 5G

2F se in Small 4A

and the second s	GOLDSTITE REAL	barre agreement of the angular frequency and the
DENNIS, R. E. Effect of Soil-Injected Ethylene on Sugarbeet	DUNSON, J. E. Genetic and Environmental Factors Involved in	FIELDING, M. B.
(Beta Vulgaris L.) Yield Parameters,	Increased Resistance of Brook Trout to Sul-	Deflection of P.V.C. Pipe Under Burial Condi- tions.
W79-00296 3F	furic Acid Solutions and Mine Acid Polluted	W79-00103 8D
DEUTSCHER, R. L.	Waters, W79-00458	FISCHER, W.
Hydrogeochemistry of a Calcrete-Containing		Battery Operated Water Purification System,
Aquifer Near Lake Way, Western Australia, W79-00323	DYRSSEN, D.	W79-00043 5F
W 77-00323	Sea-Water Neutralization of Effluents from the Industrial Processing of Phosphorite. A Case	FISHMAN, M.
DEVOL, A. H.	Study in the Practical Use of Basic Knowledge	Automated Determination of Sclenium in
Seasonal Changes in Respiratory Enzyme Ac-	in Analytical and Marine Chemistry,	Water.
tivity and Productivity in Lake Washington Microplankton,	W79-00151 5G	W79-00261 5A
W79-00212 5C	ECKENFELDER, W. W. JR.	FITZPATRICK, J. A.
DI JESO, A.	Oxygen Activated Sludge Considerations for	Characterization of Performance of Full-Scale
The Phosphagens of Some Protozoa as Ecologi-	Industrial Applications.	Tertiary Wastewater Granular Media Filters.
cal Indicators (In French),	W79-00354	W79-00371 5D
W79-00423	EDDE, H.	FORREST, G. I.
DI JESO, F.	Process Design Investigations for Alaska Pulp	The Productivity of a Range of Blanket Bog
The Phosphagens of Some Protozoa as Ecologi-	Mill Wastewater Treatment Facilities, W79-00412 5D	Vegetation Types in the Northern Pennines, W79-00202 21
cal Indicators (In French),	W 17-00-12 Annual Survey and Surv	W 79-00202
W79-00423 5A	EGBUNIWE, N.	FOWLER, T.
DINUNZIO, J. E.	Rural Water Supplies from Laterite Runoff.	Applications of Remote Sensing to Hydrologic
Evaluation of Donnan Dialysis for the En-	W79-00387	Planning, W79-00099 7B
richment of Cations,	ELCHAK, T. L.	
W79-00434 5A	Water/Energy Management and Evaluation	FRANCL, L. J.
DODD, F. P.	Model for Pennsylvania, W79-00007 6D	Effect of Soil-Injected Ethylene on Sugarbeet
Energy Conservation and Outdoor Recreation,		(Beta Vulgaris L.) Yield Parameters, W79-00296
W79-00096 6G	ELEY, K. L.	with the same and manufacture of the state of the same
DONIGIAN, A. S. JR.	Arcadia Lake Water-Quality Evaluation, W79-00463 5C	FRENCH, R.
Continuous Simulation of Nonpoint Pollution,	W 79-00463	Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.
W79-00493 5B	ELGQUIST, B.	W79-00412 5D
DOUBLE, M. L.	Sea-Water Neutralization of Effluents from the	
Recovery of Sanitary-Indicator Bacteria from	Industrial Processing of Phosphorite. A Case Study in the Practical Use of Basic Knowledge	FRIBERG, F.
Streams Containing Acid Mine Water,	in Analytical and Marine Chemistry,	Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish
W79-00444 5A	W79-00151 5G	Streams.
DOWNING, D. J.	ELLIS, J.	W79-00209 5C
Ground-Water Data, 1974-76, Indian Wells Val-	Recovery of Tin from Electroplating Solutions	FROMMHAGEN, L. H.
ley, Kern, Inyo, and San Bernardino Counties,	and Rinse Waters,	Application of Ion Exchange/Adsorption
California, W79-00253 7C	W79-00157 5D	Models to Virus Transport in Percolating Beds.
W 75-00233	ELLIS, N. H.	W79-00353 5D
DOWNING, J. A.	Carbon Contact Column,	FROYTAG, A. H.
Relationship of Rainfall and Lake Groundwater	W79-00028 5D	Effect of Soil-Injected Ethylene on Sugarbeet
Seepage, W79-00489 5B	EMILIANI, F.	(Beta Vulgaris L.) Yield Parameters.
	Total Carlotte Laborate Management of the Control o	W79-00296 3F
DRORI, M.	Counting of Aquatic Bacteria: I. Statistical	Г СЛОКА, Ү.
Flow Reducing Devices Particularly Useful as Drip Emitters for Drip Irrigation,	Analysis of the Incidence of Time Lusting from	Rational Determination of Underdrainage
W79-00031 3F	Sample collection Up to Commencement of Counting, (In Spanish),	System from the Hydraulic Point of View: Stu-
The Three Th	W79-00385 5A	dies on Underdrainage of Clayey Paddy Soil:
DUDZIK, B. E.	ENCREDC B 4	III. (In Japanese). W79-00199 2G
Design Considerations for Wastewater Treat- ment Systems at Existing Fossil Power Plants,	ENGBERG, R. A. Groundwater Quality Atlas of Nebraska.	W77-00177
W79-00358 5D	W79-00252 7C	FULK, R.
DCCCC A I		Laboratory Study of the Release of Pesticide
DUFFY, R. J. Low Molecular Weight Hydrolyzed Polyacryla-	ETTELT, G. A. Belt Type Oil Removal Unit,	and PCB Materials to the Wate Column During Dredging and Disposal Operations.
mide Used as a Scale Inhibitor in Water	Belt Type Oil Removal Unit, W79-00040 5G	W79-00286 5A
Systems,		FULLER, R. R.
W79-00027 5F	FABRI, J. O. Color Removal Process.	Designing and Operating an Oxygen Activated
DUGGINS, R. B.	W79-00042 . 5D	Sludge System Including Tertiary Alum-Mud
Drip Irrigation System,		Precipitation.
W79-00038	FAGERSTROM, T. Adaptations and Resistance to Anoxia in	W79-00350 5D
DUNCAN, T. O.		FULLERTON, D. G.
Collection Bucket for Use with Tow Nets for	ra Cinerea (Plecoptera).	Biological Oxidation and Flotation Apparatus
Larval Fish, Santanana Santa Santanana Santanan Sant	W79-00076	and Method.
W79-00070	FEDOROV, N. I.	W79-00030 5D
Nonmetallic Electrofishing Booms and Acces-	Growth Aspects of Green Ash Seedlings in	GAHIN, M.
sory Tackle,	Years Varying in Moisture (In Russian).	On the Removal of Lignosulfonates and Car-
W79-00069 7B	W79-00018 21	bohydrates from Sulfite Pulp Wash Waters

HAN Co Sii Di W

HAR Sk W нат St HAT N HAU Se

HAI L O W

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P A m

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with Activated Carbon (Zur Entfernung von	GOLDSTEIN, R. M.	GUERKE, M. L.
Ligninsulfonaten und Kohlenhydraten aus Sul- fitzellstoff-Waschwaessern mittels Aktivkohle).	Quantitative Comparison of Scining and Un- derwater Observation for Stream Fishery Sur-	Our Reclamation Future: The Missing Bet on Trees.
W79-00410 5D	vcys,	W79-00086
	W79-00072 7B	
GARDE, R. J.	GOLUBEVA, G. F.	HACKBARTH, D. Hydrogeology of the Grande Prairie Area, Al-
Air Entrainment in Radial Flow Towards In- takes.	Effect of Environmental Factors on the Dis-	berta.
W79-00315 8B	tribution of Caddis Fly Larvae in Small Rivers (In Russian).	W79-00470 E 2F
Vortex Formation at Vertical Pipe Intakes,	W79-00147	HACKNEY, C. T.
W79-00485 8B	GOODWIN, T. F. and J. amanda Land Land Land Land Land Land	Changes in Interstitial Water Salinity of a Mis-
N. S. C.	GOODWIN, T. E. The Toxicity of Phthalates to the Marine	sissippi Tidal Marsh.
GARDINER, D. K.	Dinoflagellate Gymnodinium Breve,	W79-00338
Textile Waste Waters: Treatment and Environ-	W79-00063 5C	HALL, R. W. JR.
mental Effects,	that which have been been all our difference to	Arcadia Lake Water-Quality Evaluation.
W79-00166	GRAMLICH, F. W. The Demand for Clean Water: The Case of the	W79-00463
GARY, H. L.	Charles River,	Ligano Manarajan Wakanoo lanki mpanariya kito
Grazing and Logging Effects on Soil Surface	W79-00234 - 6R	HALL, S. R.
Changes in Central Colorado's Ponderosa Pine		Case History: Ash Disposal from an Oil Fried Central Station,
Type,	GRANA, D. C. Remote Water Monitoring System,	W79-00361 5E
W79-00140 4C	W79-00047 7B	THE MAN THE STATE OF THE PROPERTY OF THE PARTY OF THE PAR
GEDNEY, R. T.		HALLENBECK, W. H.
Numerical Computation of Three-Dimensional	GRANT, J. W. Profest Profession State Washington	Determination of Chrysotile Asbestos in Rain-
Circulation in Lake Erie: A Comparison of a	Steam Stripping Reduces Condensate at Weyco Mill,	water, W79-00014 5A
Free-Surface Model and a Rigid-Lid Model,	W79-00409 3E	W 79-00014
W79-00132 2H	middlessing Managament and Stephinish	Is Chrysotile Asbestos Released from
Class of Soliday and Soliday in solid	GREEN, W.	Asbestos-Cement Pipe into Drinking Water.,
GIAM, C. S. The Toxicity of Phthalates to the Marine	A Study of the Fate of Biosolids from Biologi-	W79-00013 5A
Dinoflagellate Gymnodinium Breve,	cally Treated Effluent in Laboratory and Con- structed Streams,	HALLENBECK, W. H. JR.
W79-00063 5C	W79-00407 5C	Characterization of the Release of Chrysotile
Process Design forwards in Alask Palas		Asbestos from Asbestos-Cement Drinking
GIAQUINTA, A. R.	GRENNEY, W. J.	Water Pipe,
Wet Cooling Tower Backfitting Economics,	Preliminary Identification of the Salt Pick-up	W79-00435 5B
W79-00233 5G	and Transport Processes in the Price River Basin, Utah,	HALLHAGEN, R. G.
GIESY, J. P. JR.	W79.00145 3C	Oil Fence.
Uptake of Americum-241 by Algae and Bac-	And the state of t	W79-00036 - 5G
teria,	GREYDANUS, H. W.	The second secon
W79-00067 5B	Management Aspects of Cyclic Storage of Water in Aquifer Systems,	HAMILTON, D. A.
10 (10 (10 (10 (10 (10 (10 (10 (10 (10 (W79-00386 - 4B	Influence of Strip Mines on Regional Ground- Water Flow
GILBERT, D. W.	And the same of th	Water Flow, W79-00118 5G
Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud	GRIFFIN, C. Two-Step Roll Ahead Irrigation System,	31 (2.200.007)
Precipitation,	W79-00032 3F	HANKE, S. H.
W79-00350 5D	Action Action of the Action of	Land Prices Substantially Underestimate the
Effect of four-boards (Obvice of Together)	GRIFFIN, R. A.	Value of Environmental Quality, W79-00244 6C
GILKESON, R. H.	Geologic Studies to Identify the Source for	W 19-00244
Geologic Studies to Identify the Source for	High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,	HANSEN, D. J.
High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,	W79-00003 5A	Uptake and FAte of DI-2-Ethylhexyl Phthalate
W79-00003 5A		in Aquatic Organisms and in a Model
Special from the Heatenth Francis Williams State	GRIFFITHS, D. W. Factors Influencing Induced Air Flotation,	Ecosystem, W79-00061 5B
GILLESPIE, G. W.	W79-00375	W79-00061 5B
Distribution of Heterotrophic and Nitrifying		HARALSON, R. H.
Bacteria Within the Aerobic-Media Trickling	ORIFFII II 3, G. A.	Removal of Fluoborate from Plating Waste-
Filter, W79-00433 5D	Origin and Transport of Large Boulders in Mountain Streams,	water: Technique and Mecahnism,
Manual Manual and the state processes of	W79-00490 2J	W79-00378 5D
GILLIAM, J. W.	A SECTION AND THE PARTY OF THE	HARRIS, A.
Nature and Impact of Rural Stream Inputs on	ono a amount m.	Treatment of Water or Aqueous Systems,
Water Quality,	Looking at the Positive Side of Energy Regula- tion.	W79-00039
W79-00483	W79-00411 3E	HARRIS, E. P.
GLOECKLER, F. C.		Simple Sampler Activation and Recording
Instrumentation and Controls for Philadelphia	GROVES, D. L. Modeling for Organizational Decision-Making:	System,
Electric Company Eddystone Generating Sta-	Profits vs. Social Values in Resource Manage-	W79-00480 7B
tion Wastewater Treatment System.	ment	HARRIS, F.
W79-00357 5D	W79-00243 6A	HARRIS, F. Final Report on Field Test Evaluation and
GOLDSTEIN, J.	GRUBER, D.	Operation and Maintenance of Seawater
Economic Analysis of Selected Features of	Laboratory Study of the Release of Pesticide	Reverse Osmosis and Electrodialysis Pilot
Municipal Wastewater Construction Grant Legislation	and PCB Materials to the Wate Column During Dredging and Disposal Operations,	Plants at Wrightsville Beach Test Facility, November 1976,
W79-00246 5G	W79-00286	W79-00302 3A

Bet on

rea, Al-2F

f a Mis-2L

5C

il Fried

in Rain-5A from ater., 5A

hrysotile Drinking

SB SG

Ground-

mate the 6C

Phthalate Model 5B g Waste-

5D

ms, 5F

Recording 7B

ation and Seawater ysis Pilot Facility,

TOOM PERSON IN THE PROPERTY OF THE PERSON IN	MINERAL KILL SAFAKETAKATA	
HARRISON, P. J.	HERN, J. L.	HUFF, D. D.
Continuous Culture of Marine Diatom's Under	Continuous Electrochemical Synthesis Using a	A Field Evaluation of Subsurface and Surface
Silicon Limitation. 3. A Model of Si-Limited	Packed Granular Electrode,	Runoff, I. Tracer Studies,
Diatom Growth,	W79-00432 5D	W79-00115 2E
W79-00229 5C	77 - 18 - 19 - 19 - 19 - 19 - 19 - 19 - 19	24 CHORA P. S. C.
1 1000 march 200 mg 2000mg	Studies of Ion Exchange and Chelation Com-	A Field Evaluation of Subsurface and Surface
HARTWICK, N. J. R.	pounds Adsorbed on Granular Graphite.	Runoff, II. Runoff Processes.
Skimming Apparatus,	W79-00431 5D	W79-00116 2E
W79-00025 5G	The Developing of Party and Party an	
	HERNANDEZ, D. J.	HUFF, F. A.
HATCH, R. W.	Energy Consumption of Advanced Wastewater	Relation Between the St. Louis Urban
Stamina Tunnel Tests on Hatchery-Reared At-	Treatment at Ely, Minnesota,	Precipitation Anomaly and Synoptic Weather
lantic Salmon,	W79-00102 5D	Factors,
******	W79-00102	W79-00328 2B
W79-00075 81	HESSE, C. S.	
HATTEN, R. E.	Determination of Chrysotile Asbestos in Rain-	HUFF, P. B.
	water.	Aerobic Media Trickling Filter Applied to
New Approach Gets Results in Utah Well,	and the second of the second o	Nitrogen Control.
W79-00181	W79-00014 5A	W79-00445
HAUSER, V. L.	Investigation of Rainwater for the Presence of	
	A CONTRACT OF LOW	HUGHES, T. C.
Scepage Control by Particle Size Selection,	Aspestos, W79-00437	WASOPT Users Manual: An Integer Pro-
- W79-00484 mm (cost) of all the construct 4A	W 19-30451	gramming Methodology for Municipal/Regional
Stream! The Plantale liver of Valuesian Ep.		Water Supply Planning.
HAUSHILD, W. L.	Is Chrysotile Asbestos Released from	W79-00002 6A
Low-Flow Characteristics of Streams on the	Asbestos-Cement Pipe into Drinking Water.,	
Olympic Peninsula, Washington,	W79-00013 5A	HUMENIK, F. J.
W79-00258 2E		Nature and Impact of Rural Stream Inputs on
Medidies for Organizational Decision-Making	HIGGINS, M. A.	Water Quality,
HAVRILAK, R. J. JR.	Low Molecular Weight Hydrolyzed Polyacryla-	W79-00483 5C
Water Usage Requires Planning,	mide Used as a Scale Inhibitor in Water	
W79-00183 6D	Systems,	Simple Sampler Activation and Recording
W to contain	W79-00027 5F	System,
HAYES, E. C.		W79-00480 . 7B
	HILTY, J. D.	***************************************
Potentiometric Surface Map of the Floridan	Automatic System Cleaner for Remote Moni-	HUMPHRIES, T. S.
Aquifer in the St. Johns River Water Manage-	tor,	Low Toxic Corrosion Inhibitors for Aluminum
ment District and Vicinity, Florida, September,	W79-00051 5A	in Fresh Water,
1977,	Triding w	
W79-00275 7C	HOKAO, Z.	W79-00091 8G
	Sludge Treatment by Supersonic Jet-Flame,	HUMPHRYS, C. R.
HAYNES, D. P. ASS HOLD IN MAINTAIN		
Remote Water Monitoring System,	W79-00403	Summary of Study Findings, Phase I Report:
W79-00047 7B	MOTOR AND COMPANY OF A STREET OF A STREET	Ecological Effects of Highway Construction
	HOLMES, J. W.	Upon Michigan Woodlots and Wetlands,
HEARD, W. R.	A Novel Method of Estimating the Discharge	W79-00195 4C
Simple Venturi Device for Mixing Freshwater	of Water from Mound Springs of the Great Ar-	NO. THE PERSON WAS ASSESSED.
	tesian Basin, Central Australia,	HUNTER, E. J.
and Seawater in an Estuarine Culture System,	W79-00112 2F	Angularity Sensor Means for Center Pivot Ir-
		rigation System.
Fruit Polovice and Historian Walton agent	HONG, S.	W79-00023
HEBENSTREIT, S.	Activated Sludge System with Staggered Parti-	
Resource Analysis: Water and Energy as	tion Basin,	HUNTER, T. A.
Linked Resources,	W79-00055	Removal of Fluoborate from Plating Waste
W79-00453	0.65	water: Technique and Mecahnism.
Coronar Solt of the Crimean I wolfelf of the	HORNKE, R.	W79-00378 5I
HEINLE, D. R.	Development of an Effluent-Free Sulfite Pulp	
A Comparison by Size Class and Volume of		HUNTLEY, H. M.
Detritus Versus Phytoplankton in Chesapeake	Mill (Entwicklung zur abwasserfrei arbeitenden	An Analysis of Criticisms of Internationa
Ray	Sulfitzellstoff-fabrik).	Fishery Organizations with Reference to Three
W79-00494 2L	W79-00424	Agencies Associated with the Canadian Wes
	HOSOL T	Coast Fishery,
HEISS, H. W.	HOSOI, T.	W79-00394 61
Regional Geology Series: Part VII, The	Process Design Investigations for Alaska Pulp	NA TOTAL OF
Calarada Distant	Mill Wastewater Treatment Facilities,	HUNTZINGER, T. L.
Colorado Plateau, W79-00177 8B	W79-00412 5D	High-Flow Frequencies for Selected Streams in
W79-00177	retwo stones again to all respects to their again.	Oklahoma,
	HSIUNG, D. E.	
HEMPHILL, P. F.	Three-Dimensional Open Channel Flow.	W79-00273 21
Ground-Water Availability in the Hitchcock-	W79-00312 8B	Low-Flow Characteristics of Oklahom
Red Willow, Frenchman Valley, and Meeker-		Streams.
Driftwood Irrigation Districts, Southwest	HUBNER, H.	
Nebraska.	Biological Evaluation of Acute Toxicity of	W79-00257
W79-00260 4B	Selected Finishing Agents (Biologiczna ocena	HUPPERT, D. D.
and white the state of the stat	toksyczności ostrej wybranych środkow	Constraints to Welfare Gains Under Extende
HENGST, B.	pomocniczych),	
Battery Operated Water Purification System,	W79-00413 5C	Jurisdiction Fisheries Management, W79-00240
The state of the s		W79-00240
19 19 19 19 19 19 19 19 19 19 19 19 19 1	HUETH, D. L.	ULTCHINE M.I.
HENRIKSEN, A.		HUTCHINS, M. L.
THE RESIDENCE OF THE PROPERTY	Distributional Implications of Extended Fishe-	Nutrient Loading/Lake Trophic Condition
Chemistry of Small Norwegian Lakes, with	ries Jurisdiction: Some Research and Policy Is-	Relationships with Special Reference to the In
Special Reference to Acid Precipitation.	sues: Discussion,	fluence of Flushing Rate,
W79-00321 5A	W79-00237 6E	W79-00001 5

5C

AUTHOR INDEX

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KE

KI

KI

KI

KI

KI

KI

8A

HUTZINGER, O.

HUTZINGER, O,	JARLEVANG, L.	JONES, J. K.
Acute and Chronic Oral Toxicity of Chl- roinated Dibenzofurans to Salmonid Fishes.	How to Utilize Steam from Thermorefiners. (Hur utnyttja anga fran termoraffinoerer),	A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeake
W79-00062 5C	W79-00418	W79-00494
HUYAKORN, P. S.	JENKINS, S. R.	W19-90229
A New Finite Element Technique for the Solu-	Transpiration and Evaporation of Sewage Ef-	JONES, R. W.
tion of Two-Phase Flow Through Porous	fluent.	Case History: Ash Disposal from an Oil Fried
Media, W79-00135	W79-00088 5D	Central Station, W79-00361
W79-00135	JENNE, E. A.	W 17-00,001
IGNIZIO, J. P.	Forms of Trace Elements in Soils, Sediments.	JONES, T. I.
Water/Energy Management and Evaluation Model for Pennsylvania,	and Associated Waters: An Overview of Their Determination and Biological Availability,	Treatment of Water or Aqueous Systems, W79-00039
W79-00007 6D	W79-00271 5B	KABEL, R. L.
IL YUSCHCHENKO, T. E.	JENSEN, L. J.	Transfer of Gases at Natural Air-Water Inter-
Effect of Sulfur Deficiency on Water Regime and Intensity of Pea and Wheat Photosynthes-	The Historic Level of Great Salt Lake, Utah, W79-00264 2H	faces. W79-00127
is, (In Russian), W79-00200	JENSEN, R. A. Will indicate the contests of	KAEDING, L. R.
W/9-00200	Control of Nuisance Odors from Ponds by the	Growth and Diets of Trout from Contrasting
IMBERGER, J.	Use of Bacteria Cultures,	Environments in a Geothermally Heated
Field Investigation of Selective Withdrawal.	W79-00374 5D	Stream: The Firehole River of Yellowstone Na-
W79-00119 4A	Asbestoe-Coment Pipe and Orinking W. 161	tional Park, W79-00082
ISU, E. O.	JESSUP, D. J.	manage Washington Washington
Stream Temperature Estimation Using Kalman	Regionalization of Stormwater Response for the Tennessee Valley Using the Lag Modulus	KAHALAS, H.
Filter,	Concept,	Modeling for Organizational Decision-Making:
W79-00121 5B	W79-00447	Profits vs. Social Values in Resource Manage-
LAMACAF ton contents a starma about		ment, W79-00243
IVEY, G.	JHA, A. D.	W 79-00245
Field Investigation of Selective Withdrawal, W79-00119	High Temperature Eletrodialysis-Phase VI, W79-00303	KALVAITIS, A. N.
W79-00119 4A	W79-00303	The Vertical Planar Motion Mechanism; A
IWANAMI, S.	JOHANSEN, H. L.	Dynamic Test Apparatus for Evaluating Cur-
Process and Apparatus for Separating Oil From	Water Hardness and Cardiovascular Mortality,	rent Meters and Other Marine Instrumentation, W79-00224 7B
Water Contaminated with Oil,	W79-00171 5C	W 19-00224
W79-00050 5G	JOHANSSON, T.	KAMDAR, R.
JACKSON, I. J.	How to Utilize Steam from Thermorefiners.	Application of Ion Exchange/Adsorption
Local Differences in the Patterns of Variability	(Hur utnyttja anga fran termoraffinoerer),	Models to Virus Transport in Percolating Beds,
of Tropical Rainfall: Some Characteristics and	W79-00418	W79-00353
Implications,	A Novel Marbod of Astronomy of Moscano	KAMINO, E.
W79-00113 2B	JOHNSON, D. W. The Source of American Falls Reservoir Pollu-	Biologically Active Substances in Pulping
JACOBS, B.	tants,	Waste Liquors. I. Substances Active Against
Analysis of Radioactive Contaminants in By- Products from Coal-Fired Power Plant Opera-	W79-00004 5B	Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,
tions,	JOHNSON, W. R. III.	W79-00404
W79-00227 5A	A Study for Improving the Acrobic-Media	KAPLYUK, L. F.
The second of the second of the second	Trickling Filter,	Water and Physical Properties of the Sod-Cal-
JAHNIG, D. G. Use of Wastewater Treatment Ponds at TVA	W79-00457 5D	careous Soils of the Crimean Foothills (In Rus-
Fossil Fueled Power Plants,	JOHNSTON, R. S.	sian), and the of End Englands Charles all
W79-00356 5D	Distributional Implications of the Extended	W79-00269
Paragraph of the second street of	Economic Zone: Some Policy and Research Is-	KAPPUS, U.
JAIN, A. K.	sues in the Fishery: Discussion,	. Rainfall Frequencies for the Persian Gulf Coast
Air Entrainment in Radial Flow Towards In- takes.	W79-00238 6E	of Iran,
W79-00315 8B	JOLLEY, V. D.	W79-00123 2B
a remander Vin	Profile Accumulation of Fertilizer-Derived	KARAMIAN, N. A.
Vortex Formation at Vertical Pipe Intakes.	Nitrate and Total Nitrogen Recovery in Two	Apparatus for Producing High-Purity Water,
W79-00485	Long-Term Nitrogen-Rate Experiments with Corn.	W79-00046 5F
JANAKI RAM, K.	Corn. W79-00500	PACAL M
Control of Aquatic Weed by Moth Larvae.	Triboer W	KASAI, M. Solid-Fluid Contacting Process,
W79-00197 4A	JONES, C. J.	W79-00029 5G
Tixes I V III	Adsorption of Some Toxic Substances by	Hard Bridge Control of the State of the Control of
JANES, J. V. III Factors Influencing Induced Air Flotation.	Waste Components, W79-00152	KATHMAN, D.
W79-00375 5D	W79-00152 5B	Artificial Substrate Sampler for Benthic Inver- tebrates in Ponds, Small Lakes, and Reser-
	JONES, D. M. A.	voirs.
JANKOWSKA, T.	Climatology of Instantaneous Rainfall Rates.	W79-00074 7B
Biological Evaluation of Acute Toxicity of	W79-00327	
Selected Finishing Agents (Biologiczna ocena	JONES, E. B.	KATOPODES, N.
toksyczności ostrej wybranych środkow pomocniczych),	Flood Regions in Jamaica.	Computing Two-Dimensional Dam-Break Flood Waves,
W79-00413	W79-00330	W79-00313
(F) (100 - 1	An resumes in	MS - 12100'00 M

olume of icsapeake

Oil Fried 5E ems.

ater Inter-

Contrasting y Heated

wstone Na-

on-Making: ee Manage-

hanism; A uating Cur-

Adsorption ating Beds, 5D

in Pulping ive Against s Shiraki, in i,

the Sod-Calnills (In Rus-2G n Gulf Coast 2B

ty Water, 5F 5G

enthic Inverand Reser-7B Dam-Break

8A

KAWECKA, B.	KITAEVA, S. KH.	KOVDA, V. A.
Biocenosis of a High Mountain Stream Under the Influence of Tourism. 3. Attached Algae Communities in the Stream Rybi Potok (The High Tatra Mts., Poland) Polluted with Domestic Sewage.	Flame-Photometric Method for the Determina- tion of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method opredeleniya magniya v shehelokakh sul'fitno- tsellyuloznogo proizvodstva).	Formation of a Vermiculite Mineral from Ground Water Components (In Russian). W79-00382 2K
W79-00220 5C	W79-00415	Preliminary Study of Selected Potential En-
KAYA, C. M.	KITAKOGA, H. Apparatus for Deploying and Taking Up an Oil	vironmental Contaminants - Optical Brighteners, Methyl Chloroform, Tri-
Growth and Diets of Trout from Contrasting Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone Na-	Fence, W79-00048	Chloroethylene, Tetrachloroethylene and ion Exchange Resins, W79-00283
tional Park, Tuesday and the Manager	KJERFVE, B.	ALTERNATION OF THE PROPERTY OF
W79-00082 5C	Bathymetry as an Indicator of Net Circulation	KOWNACKI, A.
KELSO, M. M. Natural Resource Economics: The Upsetting	in Well Mixed Estuaries, W79-00488 21.	Biocenosis of a High Mountain Stream Under the Influence of Tourism. 4. The Bottom Fauna
Discipline,	KNIGHT, R. J.	of the Stream Rybi Potok (The High Tatra Mts),
W79-00242 6B	Bedforms and Their Hydraulic Stability Rela-	W79-00221 5C
KEMMER, F. N.	tionships in a Tidal Environment, Bay of	KOWSAR, A.
Color Removal Process,	Fundy, Canada,	Water Harvesting for Afforestation: I. Efficien-
W79-00042 5D	W79-00336 · 21.	cy and Life Span of Asphalt Cover,
KENSON, R. E.	KOEHLER, F.	W79-00474 3B
Modeling and Monitoring of Toxic Spills and	Nature and Impact of Rural Stream Inputs on	
Toxic Effluents,	Water Quality, W79-00483 5C	Water Harvesting for Afforestation: II. Survival and Growth of Trees,
W79-00343 5B		W79-00475 3B
Wastewater Odor Problem Solving Process	KOEHLER, F. A.	
Modification Versus Air Treatment,	Simple Sampler Activation and Recording System.	KRAMER, P.
W79-00373 5D	W79-00480 7B	Progress and Problems in the Study of Plant- Water Interrelations (In Bulgarian),
KENT, J. C.	should been a set of minimal cought of	W79-00187 21
The Source of American Falls Reservoir Pollu-	KOGAN, SH. I. Overgrowing of the Kara Kum Canal and Some	resident among discount if You will not promitted parking
tants,	Aftereffects of Introducing the White Amur	KRANENBURG, C. Internal Fronts in Two-Layer Flo.
W79-00004 5B	into Water Bodies, (In Russian),	W79-00486 8B
KHALID, M.	W79-00207	
Control of Furrow Infiltration by Compaction,	KOISE, H. C.	KRAUSE, T.
W79-00481 3F	Pretreatment Land Application of Textile Plant	On the Removal of Lignosulfonates and Car- bohydrates from Sulfite Pulp Wash Waters
KILHAM, P.	Wastes, W79-00362	with Activated Carbon (Zur Entfernung von
Morphometric Changes 'in Asterionella For-	W 79-00362	Ligninsulfonaten und Kohlenhydraten aus Sul-
mosa Colonies Under Phosphate and Silicate	KOLAR, C.	fitzellstoff-Waschwaessern mittels Aktivkohle), W79-00410 5D
Limitation, W79-00215	Our Reclamation Future: The Missing Bet on Trees,	Grand H. S. C.
Martin memerical real process of the	W79-00086 4C	KREMER, B. P.
KILHAM, S. S. Morphometric Changes in Asterionella For-	KOMANOWSKY, M.	Photosynthesis and Carbon Metabolism in Marine and Freshwater Diatoms,
mosa Colonies Under Phosphate and Silicate	Treatment of Lime-Sulfide Tannery Unhairing Waste.	W79-00208 5C
W79-00215 5C	W79-00026 5D	KREMLING, K.
TO amost the control of the control	KOON, J. H.	Studies on the Pathways and Effects of Cadmi-
KINASE, T.	Oxygen Activated Sludge Considerations for	um in Controlled Ecosystem Enclosures, W79-00066 SB
Apparatus for Deploying and Taking Up an Oil Fence,	Industrial Applications,	W79-00066
W79-00048 5G	W79-00354 5D	KRIEG, D. R.
KING, C. J.	KORHONEN, J.	Stomatal and Nonstomatal Regulation of Water
Solvent Extraction for Treatment of Waste-	Analyses of Paper Machine Waters with Ion Specific Electrodes. Part IV. Sulfate Deter-	Use in Cotton, Corn and Sorghum, W79-00016 21
W79-00366 5D	mination Using Pb(2+) Ion Specific Electrode	Water Relations and Physiological Activity of
W /9-00366	and Various measurement Methods,	Potatoes,
KIRSANOV, V. A.	W79-00429 5A	W79-00017
Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of	KORNOBIS, S.	KRIEGER, H.
Spend Sulfite Liquor (Elektrosoprotivlenie ka-	Ecology of Dreissena Polymorpha (Pall.)	Analysis of Budiocetius Conteminants in Du-
tionoselektivnoy membrany MK-40 pri elek-	(Dreissenidae, Bivalvia) in Lakes Receiving Heated Water Discharges,	Products from Coal-Fired Power Plant Opera-
trodialze otrabotannogo sul'fitnogo shcheloka).	W79-00068 5C	tions,
W79-00417		W79-00227
Energy Consumption for Electrodialysis of	KOSIK, J. Relationships Among Some Physical Properties	KRUCZYNSKI, W. L.
Spent Sulfite Liquors (Energozatraty na elek-	of Soil (In Slovenian).	Vegetative Stabilization of Dredge Spoil in
trodializ otrabotannogo shcheloka sul'fitno-	W79-00451 2G	
tsellyuloznogo proizvodstva), W79-00416	KOTERBA, M.	W79-00337
Solved the street, at 15th Union and 15th to 25	The Feasibility of Using Forest Lands for	
KIRSCHMAN, F. C.	Recycling Sludge Nutrients in Northern New	
Water Distiller with Cone Shaped Condenser, W79-00045	England, W79-00446 5E	(Osvetlitel' so v zveshennym sloem osadka), W79-00421 5D

AUTHOR INDEX

LONI Wa tair Con W7 LOU! Res Lin

LOVI Tra Pla W7 LU, F Up in Ecc W7 LULY A Aq W7

LUM An Spe mir and W7

For and Det

Car Cer W7 MAB De W8

MAC Dic Na by W7

MAK Cor Wa W7

MALI Tos nes W7

MAN. Nitu Rel W7

MAN! Hyd Age W79

KUWABARA, K.

KUWABARA, K.	LARSSON, A.	Mixing in an Arctic Fiord.
Method for Clarifying Aqueous Waste Liquids	Wet Meadows in Southern Sweden: Vegeta-	
Containing Acid Dyes,	tion, Succession and Management (In	W79-00487
W79-00053	Swedish).	and a surfact to a trace and the passes the darks.
Joseph State Company of the Company	W79-00288	LEWIS, M. 1415 Inc. 112 San to refer the commit
KUZNETSOVA, A. E.	contribution deleterated and vicentarian extractions	Aquatic Inhabitants of a Mine Waste Stream in
Use of Hydrolysis Lignin for Purification of	LASCANO, R.	
Effluents from Ammonia Production and the	Water Relations of Fritted Clays,	Arizona.
		W79-00426 - SC
Preparation of Complex Fertilizers (Primenenie	W79-00476 2G	CONTRACTOR AND INCOMES THE OWNERS OF THE PROPERTY OF
gidroliznogo lignina dlya ochistki stochnykh	36.79.00000 (III., A.M. C.	LEWKE, R. E.
vod ammiachnogo proizvodstva i polucheniya	LATHE, D. C. C. The government and enteraged	Impacts of Impoundment to Vertebrate
slozhnykh udobrenii),	Skimming Apparatus,	Animals and their Habitats in the Snake River
W79-00402 5D	W79-00025 5G	Canyon, Washington,
		W79-00146 6G
KYRIAS, G. M.	LATINOPOULOS, P. D.	W / 2-00140
Biological Oxidation and Flotation Apparatus	On the Two-Dimensional Groundwater Move-	LEZIVA A V
		LEZINA, A. N.
and Method,	ment,	Nutrition and Growth of the Bighead
W79-00030 5D	W79-00108 2F	Aristichthys Nobilis (Rich.) In Bodies of Water
and the second state of th	The Harry Council County State Authorities	of the Dagestan ASSR,
KYSELOWA, K.	LAUDANI, U.	W79-00320 2H
Benthic Algae in a Pond After the Accumula-	The Phosphagens of Some Protozoa as Ecologi-	
tion of Beet-Sugar Factory Wastes,	cal Indicators (In French),	LI, N. N.
W79-00216	W79-00423 5A	The state of the s
maching a state and and an appropriate and app	1500 1000 and and the property of the state	Removal of Ammonium Sulfide from Waste-
LAFRANCE, D. E.	LAUCHLIN C. D.	water by Liquid Membrane Process,
Low-Flow Characteristics of Streams on the	LAUGHLIN, C. P.	W79-00161 5D
	Potentiometric Surface Map of the Floridan	A R PARTY OF
Olympic Peninsula, Washington,	Aquifer in the St. Johns River Water Manage-	LICK, W.
W79-00258 2E	ment District and Vicinity, Florida, September,	Numerical Computation of Three-Dimensional
THE RESERVE TO SERVE THE PROPERTY OF THE PERSON OF THE PER	1977,	
LAIRD, N. P.	W79-00275 7C	Circulation in Lake Erie: A Comparison of a
Regional Response to Forcing in Southern	Tributes and the second	Free-Surface Model and a Rigid-Lid Model,
Strait of Georgia,	TANKE THE MAINTANT PROPERTY OF THE PARTY OF	W79-00132 2H
	LAYNE, J. N.	The state of the s
W79-00324 21.	Fish and Wildlife Inventory of the Seven-Coun-	LIMA, P. H.
* A \$7.1100 B \$7.4 B A \$7.4 B A \$7.	ty Region Included in the Central Florida	Asbestos - A Bibliography,
LAKSHMINARAYANA, V.	Phosphate Industry Area-Wide Environmental	
Digital Model Studies of Unsteady-State Radial	Impact Study. Volumes I and II,	W79-00225 5A
Flow to Partially Penetrating Wells in Uncon-		1. A CANAL
fined Anisotropic Aquifers,	W79-00100 5C	LIN, H. C.
W79-00111 2F	CONTRACTOR OF A STATE OF THE WARM	Three-Dimensional Open Channel Flow,
W 77-00111	LAZAREVA, L. P.	W79-00312 8B
Tune Curve Analysis of Time Destrology Date	Nutrition and Growth of the Bighead	W 79-00312
Type-Curve Analysis of Time-Drawdown Data	Aristichthys Nobilis (Rich.) In Bodies of Water	LICKOWITZ I
for Partially Penetrating Wells in Unconfined	of the Dagestan ASSR,	LISKOWITZ, J.
Anisotropic Aquifers,		Sorption Capabilities of Various Materials for
W79-00136 2F	W79-00320 2H	Leachate Treatment,
And the second section of the second section s		W79-00377
LALENA, P. P.	LEE, R. G.	
Waste Treatment for a Profit,	Brushland Watershed Fire Management Policy	LISKOWITZ, J. W.
W79-00359 - 5D	in Southern California: Biosocial Considera-	
	tions,	Removal of Fluoborate from Plating Waste-
1 AND 4 P	W79-00449 6B	water: Technique and Mecahnism,
LAMB, C. E.	W /7-00449	W79-00378 5D
Ground-Water Data, 1974-76, Indian Wells Val-	16, 738 WOXAINS	A STATE OF THE STA
ley, Kern, Inyo, and San Bernardino Counties,	LEE, W. Y.	LITTLEWOOD, I. G.
California,	The Effect of Naphthalene on Survival and Ac-	An Estimate of Annual Runoff from England
W79-00253	tivity of the Amphipod Parhyale,	
	W79-00081 5C	and Wales, 1728-1976,
LAMBIAGE 1 I	11.72 00011	W79-00124 2E
LAMBIASE, J. J.	LEITKO, T.	The state of the s
Bedforms and Their Hydraulic Stability Rela-		LITWIN, Y. J.
tionships in a Tidal Environment. Bay of	A Comparative Study of Community Response	Continuous Simulation of Nonpoint Pollution,
Fundy, Canada,	to Water Related Problems,	W79-00493 5B
W79-00336 2L	W79-00010 6B	1177-00493
A STATE OF THE PERSON OF THE P		LIVINGSTON D V
LAND, L. F.	LEITZ, F. B.	LIVINGSTON, R. K.
Analysis of Flood Resulting from the Toccon	High Temperature Eletrodialysis-Phase VI,	Water-Resources Appraisal of the Wet Moun-
		tain Valley, in Parts of Custer and Fremont
Falls, Georgia, Dam Break,	W79-00303	Counties, Colorado,
W79-00262 2E	A MARKET AND A STORY OF THE PARTY OF THE PAR	
	LESSEM, A. S.	W79-00274 4B
LANEY, R. L.	Arcadia Lake Water-Quality Evaluation,	HAVE IN
Maps Showing Water-Level Declines, Land	W79-00463 5C	LLOYD, J. W.
Subsidence, and Earth Fissures in South-Cen-	College of Decome Pobragons and	A Digital Model of Part of the Rio Tempisque
tral Arizona.	LETTENMAIER, D. P.	Alluvial Aquifer, Costa Rica,
		W79-00311 2F
W79-00251	Climate Change: Detection and Its Impact on	A Charles to Samuel 11 to Commercial Control in Lecture 12
LAMBALA P. C.	Hydrologic Design,	LOATS, H. JR.
LAPPALA, E. G.	W79-00492 2E	
Ground-Water Availability in the Hitchcock-	T. Miles	Applications of Remote Sensing to Hydrologic
Red Willow, Frenchman Valley, and Meeker-	LEUNG, K. S.	Planning.
Driftwood Irrigation Districts, Southwest	River Temperature Variation with Freezing and	W79-00099 7B
Nebraska.	Storage,	market the the street of the street of the street
	W79-00477 2E	LOMIDZE, D. V.
W79-00260	W79-00477	Changes in Water Regime of Brown Forest
LABOREN N		
LAPSHIN, N.	LEVI, E. permit and I be affiliated off	Soils of the Georgian SSR Under the Effect of
difficiency of Screenless Wells for Irrigation,	Eddy Production Inside Wali Layers,	Silvicultural Practices, (In Russian),
W79-00184	W79-00333 8B	W79-00401 4C
		the fact of the fa

2L Stream in

ertebrate ake River

Bighead s of Water 2H

m Waste-5D imensional

rison of a Model, 2H

SA ow.

aterials for

5D

ing Waste-

m England

2E Pollution, 5B

Wet Mound Fremont

Tempisque

2F

Hydrologic

own Forest he Effect of 4¢

STREET, STREET	TO A STATE OF THE	RAMA A Prominenciant & and with the law with
LONDQUIST, C. J. Water-Resources Appraisal of the Wet Mountain Valley, in Parts of Custer and Fremont Counties, Colorado, W79-00274 4B	MARASCO, R. Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion, W79-00231 6B	MAZITOV, L. A. Electric Resistance of the Cation-Selective MK-40 Membrane During Electrodialysis of Spend Sulfite Liquor (Elektrosoprotivlenic ka- tionoselektivnoy membrany MK-40 pri elek-
LOUNSBURY, M.	MARCONI, W. Method for Depolluting Fresh and Sea Water	trodialze otrabotannogo sul fitnogo shcheloka). W79-00417 5A
Resource Analysis: Water and Energy as Linked Resources, W79-00453	from Petroleum Products, W79-00058 5G	Energy Consumption for Electrodialysis of Spent Sulfite Liquors (Energozatraty na elek-
W79-00453	MARQUARDT, K.	trodializ otrabotannogo shcheloka sul'fitno-
LOVETT, M. B. Transuranic Nuclides in Plaice (Pleuronectes	Process for the Treatment of Water Solution by Ion Exchange.	tsellyuloznogo proizvodstva), W79-00416 5D
Platessa) from the North-Eastern Irish Sea, W79-00077	W79-00054	Flame-Photometric Method for the Determina-
The minimum and the state of th	MARSH, T. J.	tion of Magnesium in Spent Liquors of Sulfite Pulp Mills (Plamennofotometricheskii method
Uptake and FAte of DI-2-Ethylhexyl Phthalate in Aquatic Organisms and in a Model	An Estimate of Annual Runoff from England and Wales, 1728-1976, W79-00124	opredeleniya magniya v shehelokakh sul'fitno- tsellyuloznogo proizvodstva).
Ecosystem,	a W. Zeona	W79-00415
W79-00061 5B	MARSHBURN, R. Pretreatment Land Application of Textile Plant	MCCAULEY, M. N.
LULVES, W. J.	Wastes, Mangana and Mangala and Internal and Internal	Fish and Wildlife Inventory of the Seven-Coun- ty Region Included in the Central Florida
A Method of Measuring Bacterial Growth in Aquatic Environments Using Dialysis Culture,	W79-00362 5E	Phosphate Industry Area-Wide Environmental
W79-00109 5A	MARTIN, E. N. Water Filtering and Dispensing Apparatus,	Impact Study. Volumes I and II. W79-00100 5C
LUMME, P. O.	W79-00019 5F	MCENTYRE, C. L.
Analyses of Paper Machine Waters with Ion	MARTIN, S. B.	Removal of Complex Copper-Ammonia Ions
Specific Electrodes. Part IV. Sulfate Determination Using Pb(2+) Ion Specific Electrode	Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern	from Aqueous Wastes with Fly Ash. W79-00155
and Various measurement Methods, W79-00429 5A	Idaho,	MCGINNES, E. A. JR.
LUOMA, S. N.	read States at Australia Science of Surface States	A Note on Effects of Sewage Effluent Irriga- tion on Specific Gravity and Growth Rate of
Forms of Trace Elements in Soils, Sediments,	MARTIN, W. C. Water Analytical Data as a Tool in Drilling and	White and Red Oaks, W79-00425
and Associated Waters: An Overview of Their Determination and Biological Availability,	Production Economics,	And the state of t
W79-00271 5B	strains at acress, D.	MCGUGAN, P. J. Adsorption of Some Toxic Substances by
LYONS, B. W.	MARTINEZ, H. H. A Mathematical Model for Simulating Water	Waste Components,
Case History: Ash Disposal from an Oil Fried Central Station,	Demand-Supply and Energy Uses for the State	A STATE OF THE STA
W79-00361 5E.	of Pennsylvania, W79-00442	MCINTYRE, R. J. On the Environmental Efficiency of Economic
MABRY, D. R.	Water/Energy Management and Evaluation	Systems, W79-00230 6G
Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,	Model for Pennsylvania, W79-00007 6D	MCKENZIE, G. D.
W79-00370 5D	ESCALE TO	Determination of Spoil-Bank Erosion Rates in
MACISAAC, J. J.	MARUYAMA, T. Rational Determination of Underdrainage	Ohio by Using Interbank Sediment Accumula- tions.
Diel Cycles of Inorganic Nitrogen Uptake in a Natural Phytoplankton Population Dominated	System from the Hydraulic Point of View: Stu-	W79-00495 2J
by Gonyaulax Polyedra,	dies on Underdrainage of Clayey Paddy Soil: III. (In Japanese),	MCMORROW, D. J.
W79-00210 5C	W79-00199 2G	A Technique for Estimating Clock Two-Hourly Precipitation Rate Distributions.
MAKNOON, R. Conjunctive Use of Ground and Surface	MASON, O.	W79-00089 2B
Water,	Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities.	MCNEISH, J. D.
W79-00170 4B	W79-00412 5D	Stamina Tunnel Tests on Hatchery-Reared At- lantic Salmon,
MALLON, M. H. Toxicity of the Fungicide Captan to the Dunge-	MATSON, J. V.	W79-00075
ness Crab Cancer Magister.	Dynamics and Control of Suspended Solids in a Two-Step Activated Sludge Plant,	MEADOWS, M. E.
W79-00065	W79-00352 5D	Stormwater Modeling, W79-00381 5B
MANAM, R.	MAUK, C. E.	MEEROVSKAYA, V. I.
Nitrate Reductase Activity of Soybeans in Relation to other Indicators of Water Stress.	New Technology: Ozone/UV Chemical Oxida- tion Wastewater Process for Metal Complexes.	Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the
W79-00149 21	Organic Species and Disinfection.	Preparation of Complex Fertilizers (Primenenic
MANLEY, R. E.	W79-00369 5D	gidroliznogo lignina dlya ochistki stochnykh vod ammiachnogo proizvodstva i polucheniya
Simulation of Flows in Ungaged Basins. W79-00331	MAY, J. A. Direct Cooling with Ground Water	slozhnykh udobrenii).
(100 B 100 B 100 B	Direct Cooling with Ground Water, W79-00173 8C	W79-00402 5D
MANN, A. W. Hydrogeochemistry of a Calcrete-Containing	MAYES, J. H.	MEHDIZADEH, P.
Aguifer Near Lake Way, Western Australia.	Pretreatment of Industrial Wastes with Ozone,	Water Harvesting for Afforestation: I. Efficiency and Life Span of Asphalt Cover,
W79-00323 2F	W79-00368 5D	W79-00474 3B

III E

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ries sues W75 NOVII Recl Solo sian, W79 NRIAC Isote With W79

Cont W79

OKSUN How Procesen). W79-OKUBC Appa Fence W79-

Water Harvesting for Afforestation: II. Sur-	MIYAJI, T.	MUKKAY, S. P.
vival and Growth of Trees, W79-00475	Solid-Fluid Contacting Process, W79-00029	Inertial Currents Over the Inner Shelf Near 30. Degree N,
To environmental annual	and a control of the management of the start of the start of	W79-00133
MELFI, D. A. Transport of fit word I willish brook	MOLLS, F. B.	Charles Colorado abrando 2 distinato
Total Phosphorus Transport During Storm	Numerical Computation of Three-Dimensional	MURTY, V. V. N.
Events, W79-00478 5B	Circulation in Lake Eric: A Comparison of a	Pollution of Groundwater Through Nonlinear
W 79-00478	Free-Surface Model and a Rigid-Lid Model, W79-00132 2H	W79-00110 Land W W Sand W 5B
MERRILL, E. W.	W 79-00152	W79-00110 Era 124 W any air A 2 2 2 5B
Destruction of Trace Toxic Compounds in	MOLZ, F. J.	MYERS, W. A.
Water and Sludge by Ionizing Radiation,	Transpiration and Evaporation of Sewage Ef-	Pretreatment of Industrial Wastes with Ozone,
W79-00370	fluent, W79-00088	W79-00368
METCALF, R. L.	W79-00088 5D	MYERS, W. R. C.
Uptake and FAte of DI-2-Ethylhexyl Phthalate	MONTGOMERY, J. R.	Momentum Transfer in a Compound Channel,
in Aquatic Organisms and in a Model	A Comparison of Ceramic and Teflon in Situ	W79-00334 8B
Ecosystem, W79-00061	Samplers for Pore Water Determinations,	and the state of t
W 79-00001	W79-00325	NADEAU, R. J.
MEYER, R. L.	MOON, R. E.	The Biological Effects of Toxic Material Spills, W79-00344
The Effects of Heavy Metals on Algae Popula-	The Photosynthetic and Respiratory Rates and	W79-00344
tions in a South Central Reservoir,	Tolerances of Benthic Algae from a Mangrove	NAGAI, T.
W79-00011 5C	and Salt Marsh Estuary: A Comparative Study,	The Radiation-Induced Degradation of Lignin
MILLEMANN, R. E.	W79-00204	in Aqueous Solutions,
Toxicity of the Fungicide Captan to the Dunge-	MOORE, J. E.	W79-00164 5D
ness Crab Cancer Magister,	Summary of U.S. Geological Survey Investiga-	NAGELL, B.
W79-00065 5C	tions and Hydrologic Conditions in the	Adaptations and Resistance to Anoxia in
MILLER, T. D.	Southwest Florida Water Management District	Cloeon Dipterum (Ephemeroptera) and Nemou-
Water Relations and Physiological Activity of	for 1977,	ra Cinerea (Plecoptera),
Potatoes,	W79-00272	W79-00076 5G
W79-00017 21	MOORE, N. Y.	MANAGER Measureeron Mealant Months
ACCUSED TO THE PARTY OF THE PAR	Optimal Solution to the Timing, Sequencing,	NAKAJIMA, M. Method for Clarifying Aqueous Waste Liquids
MILLICAN, J. H. EPA's Goal for Suspended Solids is Not Met	and Sizing of Multiple Reservoir Surface Water	Containing Acid Dyes,
with Media Filtration,	Supply Facilities When Demand Depends on	W79-00053
W79-00414 · 5D	Price, The second of the state of the second	
Transferred American of Principles of American	W79-00438	NAPOLI, D.
MILLS, B.	MORA-CASTRO, D.	Process for Removing Mercury and Mercury
Treatment of Effluent, W79-00024 5D	A Digital Model of Part of the Rio Tempisque	Salts from Liquid Effluents, W79-00056 5D
W79-00024 5D	Alluvial Aquifer, Costa Rica,	W79-00056
MINDAY, R. M.	W79-00311 2F	NARAYANAN, R.
Removal of Ammonium Sulfide from Waste-	Manufacture of Paragraphical Company of the Company	Pressure Fluctuations Beneath Submerged
water by Liquid Membrane Process,	MOREAU, J-P. Effects of Municipal Sewage Effluent Irriga-	Jump,
W79-00161 . 3D	tion on the Trace Metal Content of	W79-00316 8B
MINDLER, A. B.	Earthworms,	NARDONE, F.
Increased Product Water Recovery by Reverse	W79-00009 5C	Process for Removing Mercury and Mercury
Osmosis Using Interstage Ion Exchange Soft-	MODGLE B B C	Salts from Liquid Effluents,
ing and a Spiractor,	MORGAN, R. P. C.	W79-00056 5D
W79-00301 3A	The Application of Linear Programming to Run-Off Management,	and Vacles of Bornanie Simons Africana
MISTINA, T.	W79-00393 4A	NEAL, J. A.
Relationships Among Some Physical Properties		Clarification Process, W79-00041 5D
of Soil (In Slovenian).	MORRISON, T. J.	W79-00041 5D
W79-00451 2G	A Pilot Plant Trial for Ozone Sterilization of	NEBOLSINE, R.
MISUMI, T.	Fish Hatchery Water, W79-00455 5G	New Developments in Oil Interception by Fil-
Solid-Fluid Contacting Process.	W /9-00433	tration,
W79-00029 5G	MORTON, J. F.	W79-00364 5D
Tronger angel	Cattails (Typha Spp.)Weed Problem or Poten-	NERI, L. C.
MITCHELL, B.	tial Crop.,	Water Hardness and Cardiovascular Mortality,
An Analysis of Criticisms of International	W79-00198	W79-00171 5C
Fishery Organizations with Reference to Three	MOSOLOVA, A. I.	
Agencies Associated with the Canadian West Coast Fishery,	Possible Use of Polymeric Materials for Fortifi-	NEROZIN, S. A.
W79-00394 6E	cation of Drainage Fills (In Russian),	Use of Hydrolysis Lignin for Purification of
to be a strong to the land of the second of	W79-00439 4A	Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenic
MITCHELL, R.	MUID I B	gidroliznogo lignina dlya ochistki stochnykh
Studies in Microbial Chemotactic Behavior in	MUIR, L. R. A General Two Dimensional River Simulator,	vod ammiachnogo proizvodstva i polucheniya
Seawater. W70.00293	W79-00397 2E	slozhnykh udobrenii),
W79-00293	W/9-0039/	W79-00402 5D
MITSCH, W. J.	MURPHY, P. G.	1.000.010
Waterhyacinth (Eichhornia Crassipes) Nutrient	An Investigation of Primary Production and	NICOL, J. A. C.
Uptake and Metabolism in a North Central	Ecosystem Metabolism in a Lake Michigan	The Effect of Naphthalene on Survival and Ac-
Florida Marsh, W79-00206 5C	Dune Pond,	tivity of the Amphipod Parhyale,
H 2200200	W79-00205	W79-00081

	(IKISHINA, E. F.	OLIVIERI, R.	PATEL, K.
ear 30 .	Effect of Environmental Factors on the Dis- tribution of Caddis Fly Larvae in Small Rivers	Method for Depolluting Fresh and Sea Water from Petroleum Products,	
2L	(In Russian), W79-00147 21	W79-00058 5G	Reverse Osmosis and Electrodialysis Pilot Plants at Wrightsville Beach Test Facility.
nlinear	NILSSON, L. M.	OMAROV, M. O. Nutrition and Growth of the Bighead	November 1976. W79-00302 3A
5B	Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish	Aristichthys Nobilis (Rich.) In Bodies of Water of the Dagestan ASSR.	PATEL-MANDIK, K.
tation t	Streams,	W79-00320	Is Chrysotile Asbestos Released from
zone,	W79-00209	OSTERKAMP, T. E.	Asbestos-Cement Pipe into Drinking Water., W79-00013
5D	Land Prices Substantially Underestimate the	Frazil Ice Formation: A Review, W79-00120 2C	PATEL, V. C.
annel,	Value of Environmental Quality, W79-00244 6C	OSTROBROD, B. G.	Wet Cooling Tower Backfitting Economics, W79-00233
88	NKEMDIRIM, L. C.	Use of Hydrolysis Lignin for Purification of Effluents from Ammonia Production and the	PATRON, G.
of signal and	Flood Regions in Jamaica, W79-00330	Preparation of Complex Fertilizers (Primenenie gidroliznogo lignina dlya ochistki stochnykh	Process for Removing Mercury and Mercury Salts from Liquid Effluents.
l Spills,	NOBLE, D. H.	vod ammiachnogo proizvodstva i połucheniya slozhnykh udobrenii),	W79-00056 5D
(x)-42,//	The Application of Linear Programming to	W79-00402	PEARSON, C-A.
Lignin	Run-Off Management, W79-00393 4A	отто, с.	Regional Response to Forcing in Southern Strait of Georgia,
5D	NODA, M.	Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish	W79-00324 21.
courtw.	Method of Disposing of Waste Water Contain- ing Emulsified Oil,	Streams, W79-00209 5C	PEKHOVICH, A. I. Allowing for the Water Permeability of Frozen
Nemou-	W79-00020 4 4 4 1 1 1 1 1 1 1 5D	OVERCASH, M. R.	Ground Screens During their Formation. W79-00467
5G	NOF, D. On Geostrophic Adjustment in Sea Straits and	Nature and Impact of Rural Stream Inputs on	PELTIER, R. V.
undahin	Wide Estuaries. Part I: One-Layer System,	Water Quality. W79-00483	Dewatering of Sludges from Oil Fried Electric Power Generating Plants,
e Liquids	W79-00131 2L	Pretreatment Land Application of Textile Plant	W79-00360 SD
5D	On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Ex-	Wastes, W79-00362 5E	PENTREATH, R. J.
New bos	periments. Part II - Two-Layer System, W79-00497 2L	OVERTON, D. E.	Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,
Mercury	NOICHL, O. J.	Stormwater Modeling, W79-00381	W79-00077
5D	Activated Sludge System with Staggered Parti- tion Basin.	OWENS, E. L.	PEQUEGNAT, W. E. Aquatic Biotal Monitor,
(Accord	W79-00055	Bioassay Results of Kraft Mill Effluent at Ar- tificially Elevated Levels of Biosolids,	W79-00033 5A
ubmerged	NOMURA, K. Method of Disposing of Waste Water Contain-	W79-00406 5C	PERETYATKO, A. I. Growth Aspects of Green Ash Seedlings in
8B	ing Emulsified Oil,	PACKARD, T. T. Scasonal Changes in Respiratory Enzyme Ac-	Years Varying in Moisture (In Russian), W79-00018
Mercury	W79-00020	tivity and Productivity in Lake Washington Microplankton,	PERKIN, R. G.
DOD-MAJNG 2	NORTON, V. J. Distributional Implications of Extended Fishe-	W79-00212 5C	Mixing in an Arctic Fjord.
5D	ries Jurisdiction: Some Research and Policy Is- sues: Discussion,	PAINE, D. Continued analyzifusion being	W79-00487 21
lemmer	W79-00237	Uptake of Americum-241 by Algae and Bac- teria,	PERNA, A. J. Removal of Fluoborate from Plating Waste
5D .	NOVIKOVA, A. F. Reclamation of Meadow-Chernozem	W79-00067	water: Technique and Mecahnism, W79-00378
tion by Fil-	Solonetzes of the Kustanai Oblast, (In Rus-	PAL, D. Pretreatment Land Application of Textile Plant	Sorption Capabilities of Various Materials fo
Panalisa 3	sian), W79-00395	Wastes, W79-00362	Leachate Treatment, W79-00377
5D	NRIAGU, J. O.	PARKER, C. E.	PERSONS, J. L.
Mortality,	Isotopic Composition of Sulfur in Precipitation Within the Great Lakes Basin,	Water Reuse at Highway Rest Areas: Evalua- tion Phase.	Heat Pump Accessories Can Save You Money. W79-00174
5C	W79-00339 5A	W79-00087 5D	PETERKA, J. J.
rification of	OBRZUT, J. J. Controls Drive Platers to Materials Recovery.	PARSONS, D. K. Effect of Soil-Injected Ethylene on Sugarbeet	Relationship of Rainfall and Lake Groundwate
ion and the	W79-00154 5D	(Beta Vulgaris L.) Yield Parameters.	Scepage, W79-00489 51
(Primenenie i stochnykh	OKSUM, J. A. How Kind to the Resources is the Grinding	W79-00296 3F	PETERSON, A. E.
polucheniya	Process. (Hvor ressursvennlig er slipeproses-	PARSONS, T. B. Biological Effects and Environmental Aspects	Effect of Whey Application on Chemical Properties of Soils and Crops,
5D	sen). W79-00408	of 1,3-Butadiene, W79-00292 5C	W79-00363 5
vival and Ac-	OKUBO, K.	PARTRIDGE, F. E.	PETRISHCHEVA, E. A. Effect of Sulfur Deficiency on Water Regim
	Apparatus for Deploying and Taking Up an Oil Fence,	Rearing of Chinook Salmon in Tributaries of the South Fork Salmon River, Idaho,	and Intensity of Pea and Wheat Photosynthesis, (In Russian),
SC.	W79-00048 5G	W79-00428 8I	W79-00200

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PFISTER, K. Characterization of Spent Bleaching Liquors.	POTTER, M. F. The Application of Linear Programming to	RAMAKRISHNA, T. S. Electrical-Resistivity Surveys for Groundwater
Part 1. Ultrafiltration of Effluents from Con-	Run-Off Management,	in the Deccan Trup Country of Sangli District;
ventional and Oxygen Bleaching Sequences, W79-00419 5D	W79-00393	Maharashtra, W79-00107
Phones as Weighter the Boards Long of militar	POULIOT, P. W.	E THOUSEW
PHILIP, J. R.	Case History: Ash Disposal from an Oil Fried	RAMER, J. L.
Solute Transport During Absorption of Water by Soil: Laboratory Studies and their Practical	Central Station. W79-00361 5E	W79.00044
Implications, A. ARTAMATATAT	William About the country of the work and the	debrate Communities in Section and the
W79-00472 - 2G	POWERS, W. L. Nitrate Reductase Activity of Soybeans in	RANDALL, J. H.
PHIPPS, G. L.	Relation to other Indicators of Water Stress,	Chlorofluorocarbons as Hydrologic Tracers A New Technology,
Asbestos - A Bibliography, W79-00225	W79-00149	W79-00461 And American American SA
Mar Couling You or Bucketting is egregated to an	PRENGLE, H. W. JR,	Tracing Sewage Effluent Recharge - Tucson,
PICKERING, J. A. A Model for Evaluating Alternative Land	New Technology: Ozone/UV Chemical Oxida-	Arizona,
A Model for Evaluating Alternative Land Developments Around Lakes,	tion Wastewater Process for Metal Complexes, Organic Species and Disinfection,	W79-00299
W79-00460 4C	W79-00369 5D	RANDOLPH, A. D.
PICKUP, G.	PRICE, M. T. Steller Song regularities to	Hydrolysis of Iron from Acidic Liquors,
Potential and Limitations of Rainfall-Runoff	A Comparison of Ceramic and Teflon in Situ	W79-00228 .N .G .AJU 5D
Models for Prediction on Ungauged Catchments: A Case Study from the Papua	Samplers for Pore Water Determinations,	RANGA RAJU, K. G.
New Guinea Highlands,	W79-00325	Vortex Formation at Vertical Pipe Intakes,
W79-00491 2A	PRUDNIKOV, A. D.	W79-00485 8B
PIERRE, W. H.	A Lysimetric Study of Waters in an Irrigated Pasture (In Russian),	RAO, K. R. W Man W la golzogeid to bodieth
Profile Accumulation of Fertilizer-Derived	W79-00284 2G	Toxicity of Sodium Pentachlorophenate (NA-
Nitrate and Total Nitrogen Recovery in Two Long-Term Nitrogen-Rate Experiments with	BUCKER D F WHEN HAVE BEAUGHTA	PCP) to the Grass Shrimp, Palaemonetes Pugio,
Corn	PUGNER, P. E. WASOPT Users Manual: An Integer Pro-	at Different Stages of the Molt Cycle, W79-00078
W79-00500 2G	gramming Methodology for Municipal/Regional	
PILGRIM, D. H.	Water Supply Planning, W79-00002 6A	RAPHAEL, D. L. Water/Energy Management and Evaluation
A Field Evaluation of Subsurface and Surface	The Property of the Control of the C	Model for Pennsylvania,
Runoff, I. Tracer Studies, W79-00115	PURRINGTON, J. M. Management Plan for Control and Treatment of	W79-00007 6D
Transaction - War later of the Printer of the State of th	Toxic Substances,	RATHBUN, R. E.
A Field Evaluation of Subsurface and Surface Runoff, II. Runoff Processes,	W79-00346 5G	Laboratory Studies of Gas Tracers for Reaera-
W79-00116 2E	PURSELL, C. F.	tion,
PINDER, G. F.	Our Reclamation Future: The Missing Bet on	W79-00270
A New Finite Element Technique for the Solu-	Trees, W79-00086 4C	RATTI, G.
tion of Two-Phase Flow Through Porous Media.	An an design of single positive to demand	Process for Removing Mercury and Mercury Salts from Liquid Effluents,
W79-00135 2F	PYEN, G. Automated Determination of Scienium in	W79-00056
PICZE, J.	Water,	
Studies on the Pathways and Effects of Cadmi-	W79-00261	RAYMOND, R. H. Maps Showing Water-Level Declines, Land
um in Controlled Ecosystem Enclosures, W79-00066 5B	QUINLAN, P. M.	Subsidence, and Earth Fissures in South-Cen-
	Employing Methylene Phosphonates of Oxyal-	tral Arizona, W79-00251
PLATTS, W. S. Hydrochemical Influences on the Fishery	kylated Pólyalkylene Polyamines in Chelation and/or Scale Inhibition.	
Hydrochemical Influences on the Fishery Within the Phosphate Mining Area of Eastern	W79-00052 5F	REIZES, J. A.
Idaho.	QUINN, F. H.	Numerical Study of Continuous Saltation, W79-00314
W79-00427 5C	Lake Superior Regulation Effects,	maxing a solution to minerally and
Rearing of Chinook Salmon in Tributaries of	W79-00388	RESENDEZ MEDINA, A.
the South Fork Salmon River, Idaho, W79-00428	RAB, E.	Study of the Fishes of the Lagoon of Alvarado, Verseruz, Mexico (In Spanish),
The state of the s	Continuous Standard Water Delivery System	W79-00079
PLUMB, R. H. Arcadia Lake Water-Quality Evaluation.	for Bioassays with Aquatic Organisms, W79-00073	RETI, A. R. or rolling he will require a significant
W79-00463 5C	RAJAGOPALAN, S. P.	Molecular Fractionation by Staged Ultrafiltra-
PONTIUS, F. W.	RAJAGOPALAN, S. P. Digital Model Studies of Unsteady-State Radial	tion,
Characterization and Treatment of Stormwater	Flow to Partially Penetrating Wells in Uncon-	W79-00367
Runoff, W79-00005	fined Anisotropic Aquifers, W79-00111	RHEE, G. Y.
		Effects of N:P Atomic Ratios and Nitrate
POST, F. J. A Procaryotic Intracellular Symbiont of the	Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined	and Nitrate Uptake,
Great Salt Lake Brine Shrimp Artemia Salina	Anisotropic Aquifers,	W79-00211 5C
P(L.), EMOCREM	W79-00136	RICHARD, M. R.
W79-00298 2H	RAJU, K. G. R.	What's in the Water, A Look at the Proposed
report of a frematiaceous tryphomyeete from	Chilathica in Radial Flow Towards in	EPA Regulations for Organic Chemicals in Public Water Supplies,
the Great Salt Lake, Utah, W79-00297 2H	W79-00315 8B	W79-00179 5F
12 W 14 0020W - W200 H4 W 20	18 (CACACAC)	2) As a meging HPO00-Mc/Al.

ndwater	RICHARDSON, D. R.	RUKVICHAI, C.	SCHWERI, W. F. II
District;	Vegetation of Southeastern Florida Parts II -	Operating Model for the Green River Basin	Organized Resistance to an Imposed Environ-
duren	W79-00196	Reservoir System, W79-00452 4A	mental Change. A Reservoir in Eastern Ken-
AB	\$15000000 F00001-1500*	TE (001)	tucky. W79-00142 6B
1	RICKER, N. L.	SALTER, F. H. World metall temperate stated	
0.008/104	Solvent Extraction for Treatment of Waste-	Simple Venturi Device for Mixing Freshwater and Scawater in an Estuarine Culture System,	SEELIG, W. N.
5D	waters from Acetic-Acid Manufacture, W79-00366	W79-00071 7B	Hydraulies of Great Lakes Inlets, W79-00469 8B
en anny	W79-00366 5D	Print and Red Corn.	10.11
racers A	RILEY, J. P.	SAMESHIMA, K.	SEIBEL, E.
lacers A	Preliminary Identification of the Salt Pick-up	Biologically Active Substances in Pulping Waste Liquors. I. Substances Active Against	The Determination of Quantity and Quality of
5A	and Transport Processes in the Price River Basin, Utah,	Termites, Coptotermes Formosanus Shiraki, in	Great Lakes United States Shoreline Eroded Material.
Outline	W79-00145 3C	Kraft Pulping and Bleaching Wastes,	W79-00249
Tucson,	ACcomplete (see)	W79-00404 5D	P. Stort, at Leading and at Edgment Strengthatana
- 64	RIZAEV, N. U.	SATO, K.	SEIM, W.
the state	Use of Hydrolysis Lignin for Purification of	Degradation of Aqueous Phenol Solution by	Bioassay Results of Kraft Mill Effluent at Ar-
1079-00	Effluents from Ammonia Production and the Preparation of Complex Fertilizers (Primenenic	Gamma Irradiation,	tificially Elevated Levels of Biosolids, W79-00406 5C
s,	gidroliznogo lignina dlya ochistki stochnykh	W79-00153 5D	Milliand Company of Children
. H.141 5D	vod ammiachnogo proizvodstva i polucheniya	SAUNDERS, G. W.	SELIGER, H. H.
Count.	slozhnykh udobrenii),	Phytoplankton Extracellular Release and Its	Annual Subsurface Transport of a Red Tide
akes,	W79-00402	Relation to the Seasonal Cycle of Dissolved Or-	Dinoflagellate to its Bloom Area: Water Circu- lation Patterns and Organism Distributions in
8B	ROACH, J. A. G.	ganic Carbon in a Eutrophic Lake,	the Chesapeake Bay,
MODERA, AN	Identification of Kepone Alteration Products in	W79-00213 5C	W79-00317 5C
indise?d	Soil and Mullet,	SCHAD, T. M.	hig be an indiged brothew him to non-steam.
nate (NA-	W79-00080 # 5A	The National Water Commission Revisited Per-	SEPHTON, H. H. Vapor Compression Energy Reduction by Ver-
tes Pugio,	ROBERT, J. M.	spective on National Water Policy Studies,	tical Tube Foam Evaporation of Scawater,
SC	First Ecological Data on the Oyster Ponds in	with some Implications for Changes in Future Water Policy,	W79-00015 3A
170m Gel	the Bay of Bourgneuf (In French).	W79-00383 6F	
N SERVI	W79-00295	A COURSE AND A STREET OF THE PERSON OF THE P	SEWELL, W. R. D.
Evaluation	Membership in the second forces affect the	SCHAU, H. C.	Water Administration in England and Wales Impacts of Reorganization,
6D	ROBERTIELLO, A. HORBITO I AND WORLD TO A	Simple Model for Ocean Outfall Plumes, W79-00479	W79-00384 6E
d of mor	Method for Depolluting Fresh and Sea Water from Petroleum Products,	1,000,000,000	No. of the last of
dominal.	W79-00058 5G	SCHIEBE, F. R.	SHANHOLTZ, V. O.
or Reaera-	Application of Lot Printed by New York	Control of Water Residence Time in Small	A Model for Evaluating the Effect of Land
NOICHE	ROCK, D.	Reservoirs, W79-00482	Uses on Flood Flows, W79-00450 4C
5A	Pretreatment Land Application of Textile Plant	W /9-00462	40
self moit	Wastes, W79-00362	SCHILLER, A. M.	SHEARER, M. T.
d Mercury	The San Vertical Description of the Walder	Low Molecular Weight Hydrolyzed Polyacryla-	Influence of Nitrogen Fertilization on the
WHAT I'M	ROESLER, F. C.	mide Used as a Scale Inhibitor in Water Systems,	Quality and Quantity of Streamflow from a Forested Watershed,
5D	Treatment of Solids-Liquid-Gas Mixtures,	W79-00027 5F	W79-00448 5B
odd et	W79-00022 5D	AND REAL PROPERTY OF THE PARTY	
ines, Land	ROOS, D. V. D. S.	SCHIPPER, I. A. Membrane Concentration of Infectious Bovine	SHEIH, M.
South-Cen-	Hailstone Size inferred from Dents in Cold-	Rhinotracheitis Virus from Water,	Sorption Capabilities of Various Materials for
Distribut	Rolled Aluminum Sheet,	W79-00148 5C	Leachate Treatment, W79-00377 5D
7C	W79-00139 7B	Mathematical or Committee of the Committ	The state of the s
EHILET VEH	ROSE, M.	SCHULTZ, T. R. Chlorofluorocarbons as Hydrologic Tracers A	SHELBY, S. E.
ation,	Economic Analysis of Selected Features of	New Technology,	Oxygen Activated Sludge Considerations for
8B	Municipal Wastewater Construction Grant		Industrial Applications, W79-00354 5D
the contract of M	Legislation,	Tarrier Saure Effect Backers Trans	
TOMOROE.	W79-00246	Tracing Sewage Effluent Recharge - Tucson, Arizona,	Shelio, I. F.
of Alvarado,	ROSENDAHL, P. C.	W79-00299 5A	Numerical Computation of Three-Dimensional
2L	Transport Characteristics of Phosphorus in		Circulation in Lake Erie: A Comparison of a Free-Surface Model and a Rigid-Lid Model,
L, FOADA	Channelized and Meandering Streams,	SCHULZ, R. B.	11/70 00122
# 20011500y1	W79-00391	Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,	Assessment of Time Tongs Congression
Ultrafiltra-	ROSS, B. B.	W79-00370 5D	SHERMA, J.
£D.	A Model for Evaluating the Effect of Land	COMPANION I P	cides and Related Compounds in Human and
1 1 3 3 1 5D	Uses on Flood Flows,	SCHUMACHER, J. D. Regional Response to Forcing in Southern	
Nongowa M	W79-00450 4C	Charle of Connels	W79-00287 5A
and Nitrate	ROUBA, J.	W79-00324 ; 2L	CUEDDITI M C
Composition,	Biological Evaluation of Acute Toxicity of		SHERRILL, M. G. Geology and Ground Water in Door County.
5C	Selected Finishing Agents (Biologiczna ocena	SCHUTH, C. K. Uptake and FAte of DI-2-Ethylhexyl Phthalate	
30	toksyczności ostrej wybranych srodkow	in Aquatic Organisms and in a Model	
Supply W	pomocniczych),		
he Proposed	W79-00413	Ecosystem, W79-00061 5B	SHIH, S. F.
Chemicals in	RUFF, J. F.	SCHWARTZMAN, E. H.	
SF SF	Shunt Meters with Segmental Orifices,	Energy Conversion System,	Studies,
0.000-PEW	W79-00335 3F	W79-00037 4B	W79-00114 2G
	The second secon		

A Socion L W79-0

STRELI Comp Flood W79-4 STRZEI Biolo Selectoksy pomowy9-

STUDL Deter Ohio tions W79 STUFF A So Shall W79 STYRC Usir Roce W79

SUBR. Veg Nor W79

SUND App Mod W79

SUTE On Dev Pol-Lak W7

SUZU The in A W7

SVAI Co W7

Div teb Str W

SWA Ch Te W

SWA Ge Ind fun W: W' SWE Le Mc

SHIH, W. F. P.	SLOSS, J. M.	SPECHT, S. A.
Use of Dummy Variables in Water Resources	Free-Surface Seepage Problem,	Geologic Studies to Identify the Source for
Studies,	W79-00496	High Levels of Radium and Barium in Illinois
W79-00114 2G	SMILES, D. E.	Ground-Water Supplies: A Preliminary Report, W79-00003
SHIVAS, S. A. J.	Solute Transport During Absorption of Water	W/9-00003
The Environmental Effects of Chromium in	by Soil: Laboratory Studies and their Practical	SPIERENBURG, T. P.
Tannery Effluents,	Implications, and the last of the ward but	Continuous Standard Water Delivery System
W79-00156 5C	W79-00472 2G	for Bioassay's with Aquatic Organisms,
21111777 12 1		W79-00073 5A
SHULTZ, D. J. Laboratory Studies of Gas Tracers for Reacra-	SMIRNOVA, V. A.	SPRINGER, E. P.
tion,	Energy Consumption for Electrodialysis of	Influence of Nitrogen Fertilization on the
W79-00270 5A	Spent Sulfite Liquors (Energozatraty na elek-	Quality and Quantity of Streamflow from a
de la contraction de la contra	trodializ otrabotannogo sheheloka sul'fitno-	Forested Watershed,
SHUMWAY, S. E.	tsellyuloznogo proizvodstva), W79-00416	W79-00448 5B
Effects of Feeding and of Chemical Stimulation	W 79-00416	AND A SEASON
on the Oxygen Uptake of Nassarius Reticulatus	Flame-Photometric Method for the Determina-	SROKOSZ, K.
(Gastropoda: Prosobranchia), W79-00083	tion of Magnesium in Spent Liquors of Sulfite	Phytophilous Fauna in Ponds Fertilized with Sugar Factory Wastes,
White and the second se	Pulp Mills (Plamennofotometricheskii method	W79-00217 Sugar Pactory Wastes.
SIMONS, T. J.	opredeleniya magniya v shehelokakh sul'fitno-	is the sale related of letter or significant depths
Generation and Propagation of Downwelling	tsellyuloznogo proizvodstva),	STALLCUP, J. A.
Fronts,	W79-00415	Fish and Wildlife Inventory of the Seven-Coun-
W79-00128 2H	SMITH, A. J.	ty Region Included in the Central Florida
SIMPSON, R.	Adsorption of Some Toxic Substances by	Phosphate Industry Area-Wide Environmental
Growth, Mortality, and Biomass Partitioning in	Waste Components,	Impact Study. Volumes I and II,
Freshwater Tidal Wetland Populations of Wild	W79-00152 5B	W79-00100 5C
Rice (Zizania Aquatica Var. Aquatica),	- Washing a deduced a mark has been after	STANKEVICH, R.
W79-00214 5C	SMITH, C. R.	Efficiency of Screenless Wells for Irrigation,
	Treatment of Effluent,	W79-00184 3F
SIMS, A. L.	W79-00024 5D	27 mai, Explosion Duly on the Dynes Mary at
Climatology of Instantaneous Rainfall Rates,	management of the second time of the property of	STARZECKA, A.
W79-00327	SMITH, D. R.	Biocenosis of a High Mountain Stream Under
SINGH, K. P.	Simulation of Cold Cloud Precipitation in a	the Influence of Tourism. 2. Bacteria as an
Optimal Operation of Shelbyville and Carlyle	Three Dimensional Mesoscule Model, W79-00468 2B	Index of Water Pollution on the Rybi Potok
Lakes,	W 77-00-00	Stream, W79-00219 5C
W79-00392 4A	SMITH, F. J.	W79-00219 5C
CINNAMON II I	Distributional Implications of the Extended	STEELE, T. D.
SINNAMON, H. I. Treatment of Lime-Sulfide Tannery Unhairing	Economic Zone: Some Policy and Research Is-	A Field Evaluation of Subsurface and Surface
Waste.	sues in the Fishery: Discussion,	Runoff, II. Runoff Processes,
W79-00026 5D	W79-00238 6E	W79-00116 2E
- Lot Alexander & Letter and Conference All Later and Conference a	SMITH, J. L. Webshell tiges w adapted by section	THE COLUMN THE PROPERTY OF THE
SIVADJIAN, J.		STEIMLE, S. E.
Chemical Inhibitors of Plant Transpiration: IV.	Control of Furrow Infiltration by Compaction,	Effects of Dissolved Oxygen in the Oxygena-
Action of Alar-85, (In French),	W79-00481 3F	tion Activated Sludge Process, W79-00351 5D
W79-00247 2D	SMITH, R. A. H.	W 79-00331
SJOSTROM, E.	The Productivity of a Range of Blanket Bog	STEINER, G. R.
Characterization of Spent Bleaching Liquors.	Vegetation Types in the Northern Pennines,	Removal of Complex Copper-Ammonia Ions
Part 1. Ultrafiltration of Effluents from Con-	W79-00202 21	from Aqueous Wastes with Fly Ash,
ventional and Oxygen Bleaching Sequences.		W79-00155 5D
W79-00419 5D	SMITH, R. C.	Use of Wastewater Treatment Ponds at TVA
SJOSTROM, P.	Optical Classification of Natural Waters,	Fossil Fueled Power Plants,
Diversity and Environments of Benthic Inver-	W79-00318 2L	W79-00356 5D
tebrate Communities in South Swedish	SNIEDOVICH, M.	manufacture manufacture with the same to the
Streams.	Dynamic Programming and the Principle of Op-	STEPHENS, D. W.
W79-00209 5C	timality: A Systematic Approach,	Laboratory Studies of Gas Tracers for Reaera-
Manufacture of the company of a lateral Manufacture of	W79-00396 6A	tion,
SKIDMORE, E. L.	The state of the s	W79-00270 5A
Nitrate Reductase Activity of Soybeans in	SONG, C. C. S.	STEVENS, M. D.
Relation to other Indicators of Water Stress,	River Temperature Variation with Freezing and	Ground-Water Levels in Wyoming, 1977,
W79-00149 21	Storage,	W70-00250 7C
SLAYMAKER, O.	W79-00477 2E	
Mass Balance Model for Calculation of Ionic	SONG. D. S.	STEVENS, R. G.
Input Loads in Atmospheric Fallout and	SONG, D. S. Low Molecular Weight Hydrolyzed Polyacryla-	Water Relations and Physiological Activity of
Discharge from a Mountainous Basin,	mide Used as a Scale Inhibitor in Water	Potatoes,
W79-00332 5B		W79-00017 21
SIESTELL W. C.	W79-00027 5F	STOKES, G. N.
SLEATH, J. F. A. Measurements of Bed Load in Oscillatory		Asbestos - A Bibliography,
Flow,	SORENSEN, R. M.	W79-00225 5A
W79-00141 2J		
	W79-00469 8B	STORCH, T. A.
SLOOFF, W. Talkin		Phytoplankton Extracellular Release and Its
Continuous Standard Water Delivery System	SPALDING, R. F.	
for Bioassays with Aquatic Organisms.	Groundwater Quality Atlas of Nebraska,	ganic Carbon in a Eutrophic Lake,
W79-00073	W79-00252	W79-00213 5C

urce for n Illinois Report, 5A

System

5A

on the from a

5B 5C ven-Cound Florida ronmental 5C

igation,

am Under eria as an ybi Potok

5C and Surface
2E

Oxygena5D

5D ds at TVA 5D for Reaera-

1977. 7C

Activity of 21

5A

se and Its ssolved Or-

User's Monant for EXPLOSE-U. S.River Bode.		
A Socio-Economic Approach to Water Pollu-	SYZDEK, L. D. Seven Problems in Bubble and Jet Drop	THOMAS, R. G. Shortest Path Problems in Hydrogeology.
tion Law Enforcement in England and Wales,	Researchers,	W79-00137 Annual Second
W79-00245 1 101 1 deals and garden 5G	W79-00319 8B	Oct. At The Action of the Action of the
STRELKOFF, T.	SZOPA, P. S.	THORNTON, J. R.
Computing Two-Dimensional Dam-Break	A Note on Effects of Sewage Effluent Irriga-	On the Environmental Efficiency of Economic Systems.
Flood Waves,	tion on Specific Gravity and Growth Rate of	W79-00230 - 6G
W79-00313	White and Red Oaks,	THANK'TAN' E' W
STRZELECKA, B. Salesbare Bare beautiful	W79-00425	THORNTON, K. W. Areadia Lake Water-Quality Evaluation.
Biological Evaluation of Acute Toxicity of	TABAKIN, R. B.	W79-00463 5C
Selected Finishing Agents (Biologiczna ocena	Oil/Water Separation Technology: The Options	Clerk of Lay Rose Some English of the
toksyczności ostrej wybranych środkow pomocniczych),	Available - Part 2,	THURNAU, R. C. Ion Selective Electrodes in Water Quality Anal-
W79-00413	W79-00158	11.10.20.00.00
AS 4.111 1414 1414 1414 1414 1414 1414 14	TACCHI, K. J.	W79-00223 5A
STUDLICK, J. R. J. Determination of Spoil-Bank Erosion Rates in	Critical Analysis of Flotation Performance.	TILMAN, D.
Ohio by Using Interbank Sediment Accumula-	W79-00376	Morphometric Changes in Asterionella For-
Streng la the Pacine Northwest & Pal service	TAI, D. Y.	mosa Colonies Under Phosphate and Silicate
W79-00495 2J	Laboratory Studies of Gas Tracers for Reacra-	Limitation, W79-00215
STUFF, R. G.	tion,	Mr. Harding Provious in the Evidence
A Soil Moisture Budget Model Accounting for	W79-00270 philoreness of soul W as sol gas 5A	TOLIKAS, D. K.
Shallow Water Table Influences,	TAKAHASHI, T.	On the Two-Dimensional Groundwater Move-
W79-00473	Mechanical Characteristics of Debris Flow,	ment, W79-00108 2F
STYROVA, N. V.	W79-00117 .A.J. # OST 2J	ZAVASHILLA, T
Using Ice as Water-Impermeable Element in	TAKAMURA, N.	TOMPKINS, T.
Rockfill Dams, W79-00466 8D	Biologically Active Substances in Pulping	A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand
A The Mary Law	Waste Liquors. I. Substances Active Against	Canyon and Vicinity,
SUBRAHMANYAM, C. B.	Termites, Coptotermes Formosanus Shiraki, in Kraft Pulping and Bleaching Wastes,	W79-00285
Vegetative Stabilization of Dredge Spoil in North Florida,	W79-00404 1 1 1 1 1 1 2 2 1 1 1 1 1 1 1 5 D	TRACY, K. D.
W79-00337 5G	TAPINOTO K	Controlling and Monitoring Activated-Sludge
A finite of Council But in O. S. A. TTAW	TAKIMOTO, K. Degradation of Aqueous Phenol Solution by	Units, we assessed the track and and a
SUNDARAM, S. San Francisco de la Companya del Companya de la Companya de la Companya del Companya de la Company	Gamma Irradiation,	W79-00160 5D
Application of Ion Exchange/Adsorption Models to Virus Transport in Percolating Beds,	W79-00153	TRAINA, V. J.
W79-00353	TANNER, C. E.	Aboveground Sprinkling Device for Sprinkling
Market of the second of the second of	Remote Monitoring of Coal Strip Mine Reha-	System, System to the standing and the s
SUTER-WEIDER, P. On the Vertical Distribution and Seasonal	bilitation,	W79-00059
Development of the Density of Dreissena	W79-00226	TRATTNER, R.
Polymorpha Larvae in the Pelagic Zone of the	TAYAMA, H.	Oil/Water Separation Technology: The Options
Lake of Zurich (In German),	Apparatus for Deploying and Taking Up an Oil	Available - Part 2,
W79-00280 terril box port at the base 5F	Fence,	W79-00158
SUZUKI, N.	W79-00048 5G	Sorption Capabilities of Various Materials for
The Radiation-Induced Degradation of Lignin	TEAGUE, J. D.	Leachate Treatment, W79-00377
in Aqueous Solutions, W79-00164		W79-00377
MANAGEMENT OF COMMENT DISTRIBUTIONS	W79-00035 8D	TRUBIN, A. I.
SVARZ, J. J.	TEARE, I. D.	Formation of a Vermiculite Mineral from
Color Removal Process, W79-00042	Nitrate Reductase Activity of Soybeans in	Ground Water Components (In Russian), W79-00382 2K
	Relation to other Indicators of Water Stress,	TO TOURS AND A TOTAL MANAGEMENT OF THE AND ASSOCIATED ASSOCIATED AND ASSOCIATED AND ASSOCIATED ASSOCIATED ASSOCIATED ASSOCIATED AND ASSOCIATED ASSOCIAT
SVENSSON, B. W.	W79-00149 21	TRUITT, M. M.
Diversity and Environments of Benthic Inver- tebrate Communities in South Swedish		Water Well Development Decisions, W79-00167 8B
Streams,	A Note on Effects of Sewage Effluent Irriga-	A LA A PARACI
W79-00209	tion on Specific Gravity and Growth Rate of	
SWANSON, C. L.	White and Red Oaks, W79-00425	Destruction of Trace Toxic Compounds in Water and Sludge by Ionizing Radiation,
SWANSON, C. L. Characterization of Performance of Full-Scale	tention because the second colors of the second	W79-00370 5D
Tertiary Wastewater Granular Media Filters.	THACKER, W. C.	VAX 8ATES CHEST.
W79-00371	Comparison of Finite-Element and Finite-Dif- ference Schemes. Part 1: One-Dimensional	
SWARTS, F. A.	Gravity Wave Motion,	Rhinotracheitis Virus from Water.
Genetic and Environmental Factors Involved in	W79-00129 2L	W79-00148
Increased Resistance of Brook Trout to Sul-		TSUDA, S. W. WARREN OF THE CONTROL O
furic Acid Solutions and Mine Acid Polluted Waters.	ference Schemes. Part II: Two-Dimensional	
W79-00458 5C	Gravity Wave Motion.	Gamma Irradiation,
SWUUNDV C D	W79-00130	
SWEENEY, C. D. Leaching Characteristics of Various Heavy		TSYTOVICH, N. A.
Metals, Non-Heavy Metals and Anions from	Controlling and Monitoring Activated-Sludge	Using Ice as Water-Impermeable Element in
Municipal Sewage Sludge Ash, W79-00459 5B	Units, W79-00160 5D	Rockfill Dams. W79-00466
W79-00459 5E	W79-00160 5D	W79-00466

TUBIELLO, G.		User's Manual for EXPLORE-I: A River Basin
Process for Removing Mercury and Mercury	The UNOX Process: Effective Wastewater	Water Quality Model. Appendix B,
Salts from Liquid Effluents,	Treatment Practice, W79-00347	W79-00189
W79-00056 5D		A Water Quality Model for the South Platte
TUCKER, J. H.	VAZIRI, E.	River Basin, Documentation Report,
Ashestos - A Bibliography,	Water Harvesting for Afforestation: I. Efficien-	W79-00398 5 5B
W79-00225 5A	cy and Life Span of Asphalt Cover,	Encode with Agricult Organity Manual South
	W79-00474 3B	WAITE, T. D.
TURNER, M.	Water Harvestine for Afforestation: II Sur-	Transport Characteristics of Phosphorus in
Solid State Event Recorder for Rainfall Mea-	water Harvesting for Afforestation. II. Sur-	Channelized and Meandering Streams,
surement,	vival and Growth of Trees.	W79-00391 duple In north Nev's hofe to 5B
W79-00125	Application action of the production of case of the parties and Application	Science to the country of the second country.
TURNER, M. T.	VERHOFF, F. H.	WALKER, W. G.
	Total Phosphorus Transport During Storm	Effect of Whey Application on Chemical Pro-
Waste Water Treatment and Re-use within the	Events, W79-00478	perties of Soils and Crops, W79-00363
Textile Industry, W79-00165	W79-00478	W79-00363 5E
W79-00165	VERMEULEN, A. J.	WALTON, R. G.
TURNER, W. M.	Acid Precipitation in the Netherlands,	The Development of the Electrical Power
Oil-Troubled Water,		System in the Pacific Northwest, A Public Pol-
W79-00169 5B	W79-00138	icy Perspective,
	VESILOV, V. A.	W70-00143
TUTUNJIAN, R. S.	Using Ice as Water-Impermeable Element in	The Control of the Co
Molecular Fractionation by Staged Ultrafiltra-	Rockfill Dams,	WATKINS, F. A. Halle doglide after his A
tion,	W79-00466 8D	Potentiometric Surface Map of the Floridar
W79-00367 5D	Mechanical Characteristics of Debril samples a	Aquifer in the St. Johns River Water Manage-
man transmit agoutte a see Appropriate	VETROVA, L. A. Effect of Environmental Factors on the Dis-	ment District and Vicinity, Florida, September
TYLER, M. A. TARRENGE	tribution of Caddis Fly Larvae in Small Rivers	1977.
Annual Subsurface Transport of a Red Tide	(In Russian),	W79-00275
Dinoflagellate to its Bloom Area: Water Circu-	W79-00147	Oil and or year
lation Patterns and Organism Distributions in	Terraties, Contatermes Fornovanes falsalis, via a	WATSON, D. S.
the Chesapeake Bay,	VIKLUND, H. I.	Effect of Whey Application on Chemical Pro
W79-00317 5C	High Temperature Eletrodialysis-Phase VI,	perties of Soils and Crops,
TYULDYUKOV, V. A.	W79-00303 3A	W79-00363
A Lysimetric Study of Waters in an Irrigated	TAKIMOTO, K.	With the C
Pasture (In Russian).	VILKER, V. L. and appropriate in ambabanged	WATT, J. P. C.
W79-00284 2G	Application of Ion Exchange/Adsorption	Field Observations of the Moisture Regime of
Transference of Language Version by ASSASTANT	Models to Virus Transport in Percolating Beds,	Yellow-Grey Earth (Otokia Silt Loam) in East
ULABY, F. T. Sarad and Jury & bostonery and	W79-00353	ern Otago, W79-00310
Agricultural and Hydrological Applications of	VINOGRADOVA, G. V.	W 79-00310
Radar: Final Report,	Correlation Between the Salt Content in the	WEAKLEY, W. P. 4 . FEBRUARY
W79-00464 7B	Hard Phase and Soil Solutions of the Murghab	Residential Water Conservation.
Country turbulars of raint Franch Shift Told?	Oasis Desert-Meadow Soils of Ancient Irriga-	W70.00440
UNNY, T. E. Cauloudy T. Benderaged wate Willer	tion, (In Russian),	holy mention is a resident of the section of the section
A General Two Dimensional River Simulator, W79-00397	W79-00203	WEBER, R. B.
W79-00397 2E		Biological Oxidation and Flotation Apparatu
CRI, N. D.	VOGEL, J. L.	and Method,
The Optimal Pricing of Undepletable Externali-	Relation Between the St. Louis Urban	W79-00030
ties,		
W79-00239 6C	Factors, W79-00328 2B	WELDAY, J. M.
The Printers of	W79-00328	Comparison of Complete Mixed Activate
URUSHADZE, T. F.	VOIGHT, D.	Sludge and UNOX Treatment of Brewer
Changes in Water Regime of Brown Forest	Nekoosa Cleans Condensates with Steam	Wastes,
Soils of the Georgian SSR Under the Effect of		W79-00348
Silvicultural Practices, (In Russian)	W79-00162 5D	WELSH, B. L.
W79-00401 4C	VOLZ N.C.	TO PROPERTY OF THE PARTY OF THE
Tancery Cancery	VOLZ, M. G.	The Effect of Reduced Wetlands and Storage Basins on the Size, Stability and Productivit
UTKAEVA, V. F.	Denitrifying Bacteria Can be Enumerated in	of the Watershed Mixing Zone,
Possible Use of Polymeric Materials for Fortifi-	Nitrite Broth, W79-00498 2G	W79-00441
cation of Drainage Fills (In Russian).		11.2-00441
W79-00439	VON BROCKEL, K.	WENGER, D.
VAN BAVEL, C. H. M.	Studies on the Pathways and Effects of Cadmi-	A Comparative Study of Community Respons
Water Relations of Fritted Clays,	um in Controlled Ecosystem Enclosures,	to Water Related Problems.
W79-00476	W79-00066 5B	W79-00010 6
Marin and Area (Area (Area Water, Area (Area)	Control of the Contro	
VAN VALKENBURG, S. D.		WETZEL, R. G.
A Comparison by Size Class and Volume of	Electric Rainfall Intensity Sensor,	An Investigation of Primary Production an
Detritus Versus Phytoplankton in Chesapeako	W 79-00329	Ecosystem Metabolism in a Lake Michiga
and Buylolus I weed'd surroups. In month regard	WADDEL, W. W.	Dune Pond,
W79-00494 2L		W79-00205
W79mint33	Water Quality Model. Appendix A.	The state of the s
VAN WILLIGEN, J.	W79-00188 5B	WHIGHAM, D.
Organized Resistance to an Imposed Environ	TALTERNATION TALET PLANNEY	Growth, Mortality, and Biomass Partitioning
mental Change. A Reservoir in Eastern Ken		Freshwater Tidal Wetland Populations of Wi
tucky.	River Basin Water Quality. Appendix C,	Rice (Zizania Aquatica Var. Aquatica),
W79-00142 6E	W79-00190 5B	W79-00214

5B
sphorus in s.
5B
sphorus in s.
5B
sphorus in S.

6E

ter Manage-

September,

nemical Pro-

Regime of a nam) in East-

n Apparatus

of Brewery

s and Storage I Productivity

2L nity Response

roduction and ake Michigan

Partitioning in lations of Wild atica),

WHILLANS, I. M. Inland Ice Sheet Thinning Due to Holocene	WITSCHONKE, C. R. Low Molecular Weight Hydrolyzed Polyacryla-	YOMTOVIAN, I.
Warmth,	mide Used as a Scale Inhibitor in Water	Lake Level Control and ManagementA Case Study,
W79-00340 2C	Systems,	W79-00390 4A
COMMENTAL SERVICE SERV	W79-00027 5F	A CALL OF THE CALL
WHITMORE, F. C.		YOSHIOKA, T.
A First Order Mass Balance Model for the Sources Distribution and Fate of PCBs in the	WITTWER, R. F.	Process and Apparatus for Separating Oil From
Environment.	Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a	Water Contaminated with Oil, W79-00050 5G
W79-00289 5B	Forested Watershed.	W 79-00030
	W79-00448 5B	YOUSSEF, N. N.
WHITTEMORE, D. O.	A.79-00160 . 57	A Procaryotic Intracellular Symbiont of the
Factors Controlling Variations in River Water	WOINSKY, S. G.	Great Salt Lake Brine Shrimp Artemia Salina
Quality in Kansas, W79-00006 5B	Process and System for Recovery of Energy	(L.),
W79-00006 5B	from Geothermal Brines and Other Water Con- taining Sources by Direct Contact with a Work-	W79-00298 2H
WHITTON, R. W.	ing Fluid Below the Critical Pressure,	ZAFFARONI, N. P.
Recovery of Tin from Electroplating Solutions	W79-00049 4B	The Toxicity of Manganese Ethylenebisdithic-
and Rinse Waters,	CANADISA DI SERGERA SER ALAREMAN DE LA CONTRACTOR DE LA C	carbamate to the Adult Newt, Triturus
W79-00157 5D	WOLFF, A. H.	Cristatus,
WILDISH, D. J.	Is Chrysotile Asbestos Released from	W79-00064 5C
Acute and Chronic Oral Toxicity of Chl-	Asbestos-Cement Pipe into Drinking Water., W79-00013	ZASLAVSKII, M. N.
roinated Dibenzofurans to Salmonid Fishes,	W79-00013 5A	Methodical Problems in the Evaluation and
W79-00062 5C	WONG, C. S.	Mapping of Erosion-Endangered Lands (In
WII VING O P	Studies on the Pathways and Effects of Cadmi-	Russian),
WILKINS, G. E.	um in Controlled Ecosystem Enclosures,	W79-00462 2J
Biological Effects and Environmental Aspects of 1,3-Butadiene,	W79-00066 5B	ZAVANDIIA T
W79-00292 5C	WOOD, W. S.	ZAVANELLA, T. The Toxicity of Manganese Ethylenebisdithic-
WYHOUGS II	Safety Aspects of Toxic and Hazardous Spills,	carbamate to the Adult Newt, Triturus
WILLIAMS, A. F.	W79-00345 5G	Cristatus,
A Novel Method of Estimating the Discharge		W79-00064 5C
of Water from Mound Springs of the Great Ar-	WOOLFENDEN, G. E.	
tesian Basin, Central Australia,	Fish and Wildlife Inventory of the Seven-Coun-	ZEMAN, L. J.
W79-00112 2F	ty Region Included in the Central Florida	Mass Balance Model for Calculation of Ionic
WILLIAMS, D. C. JR.	Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,	Input Loads in Atmospheric Fallout and Discharge from a Mountainous Basin,
A Study of Coastal Pollution and Agency Inter-	W79-00100 5C	W79-00332 5B
face,	W 72-00100	The Transfer of Chickens
W79-00389 5G	WORLEY, D. J.	ZIMMERMANN, C. F.
WILLIAMS, R. D.	Fish and Wildlife Inventory of the Seven-Coun-	A Comparison of Ceramic and Teflon in Situ
Hydrolysis of Iron from Acidic Liquors,	ty Region Included in the Central Florida	Samplers for Pore Water Determinations,
W79-00228 5D	Phosphate Industry Area-Wide Environmental	W79-00325 5A
THAT WE SHOW WATER THE PROPERTY SOUTH	Impact Study. Volumes I and II, W79-00100 5C	ZIMMERMANN, U.
WILSON, D. R.	W 75-00100	On the Vertical Distribution and Seasonal
Water Relations of Fritted Clays,	WRIGHT, J. E. JR.	Development of the Density of Dreissena
W79-00476 2G	Genetic and Environmental Factors Involved in	Polymorpha Larvae in the Pelagic Zone of the
WILSON, J. L.	Increased Resistance of Brook Trout to Sul-	Lake of Zurich (In German),
Influence of Strip Mines on Regional Ground-	furic Acid Solutions and Mine Acid Polluted Waters,	W79-00280 5F
Water Flow,	W79-00458 5C	ZITKO, V.
W79-00118 5G	W 72-00438	Acute and Chronic Oral Toxicity of Chl-
WILSON, L. G.	WRIGHT, P. J.	roinated Dibenzofurans to Salmonid Fishes,
Tracing Sewage Effluent Recharge - Tucson,	Stabilization of Earth Subsurface Layers,	W79-00062 5C
Arizona,	W79-00035 8D	70884 A C
W79-00299 5A	WRIGHT, R. F.	ZORBA, A. S. On the Two-Dimensional Groundwater Move-
	Chemistry of Small Norwegian Lakes, with	ment,
WILSON, S. A.	Special Reference to Acid Precipitation,	W79-00108 2F
Investigations of the Molecular Weight, Free	W79-00321 5A	A ster Josephy, Month America, 31
Radical and Metal Interactions of Isolated Aquatic and Soil Fulvic Acid.	THE PARTY OF THE P	ZUCKERMAN, M. M.
W79-00436 1B	WRIGHT, S. J.	Dewatering of Sludges from Oil Fried Electric
MANAGER SALES AND SERVICE IN THE SERVICE SERVI	Adsorption of Some Toxic Substances by	Power Generating Plants,
WILSON, W. B.	Waste Components, W79-00152 5B	W79-00360 5D
The Toxicity of Phthalates to the Marine	Judicilian of June 1997	
Dinoflagellate Gymnodinium Breve.	WULLSCHLEGER, R.	
W79-00063 5C	Laboratory Study of the Release of Pesticide	
WINIKKA, C. C.	and PCB Materials to the Wate Column During	
Maps Showing Water-Level Declines, Land	Dredging and Disposal Operations, W79-00286 5A	
Subsidence, and Earth Fissures in South-Cen-	W79-00286 5A	
tral Arizona,	YANO, I.	
W79-00251 7C	Apparatus for Deploying and Taking Up an Oil	
WISEMAN, W. J. JR.	Fence,	
Inertial Currents Over the Inner Shelf Near 30	W79-00048 5G	
Degree N.	YOCUM, F. H.	
W79-00133 2L	Pretreatment of Industrial Wastes with Ozone,	
	W79-00368 5D	

With the state of W. Frat Onth Major Real etc. Street on the "Willy of the special of sources of the street of the special stree error, or and Appropriate Separating I/R From Wiles Contamigated with Oil Processing THE SEER NAME, AND ASSESSED ASSESSED OF THE CONTROL OF THE CONTROL OF THE SECONDARY OF THE The Training of the quantity firsts then the training in the Adult West, Victoria Adult Magning of Engineering Street, and The Printer Its ZAVANKLLA,T The Taxaity of Manganese Subjects (Supplementarion) Typical Commercial and Transport SEC WINNESS IN Man Relate Model for calculation of forcition of tone. A. W. R. D. W. D. 100000

seems of their politiciping, or heretically WILLIAMS, A.F. WILLIAMS, D. C. AR. or other agencies betailing transfer within the The state of the s

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ORGANIZATIONAL INDEX

CHILD OF THE PARTY	CONTRACTOR OF STANCE OF STANCE AND STREET	
A.B. SJUNTORP (SWEDEN). (ASSIGNEE). Oil Fence, W79-00036 5G	AMERICAN CYANAMID CO., STAMFORD, CT. (ASSIGNEE). Low Molecular Weight Hydrolyzed Polyacryla-	ARMY ENGINEER WATERWAYS EXPERIMENT STATION, VICKSBURG, MS. ENVIRONMENTAL EFFECTS LAB.
AGRICULTURAL RESEARCH SERVICE,	mide Used as a Scale Inhibitor in Water	Arcadia Lake Water-Quality Evaluation,
OXFORD, MS. SEDIMENTATION LAB.	Systems, W79-00027	W79-00463 5C
Control of Water Residence Time in Small	Application of his Exercises exercise	ASHI KASEI KOGYO KABUSHIKI KAISHA,
Reservoirs, W79-00482	AMERICAN GROUND WATER CONSULTANTS, ALBUQUERQUE, NM.	OSAKA (JAPAN). (ASSIGNEE). Solid-Fluid Contacting Process.
W79-00482	Oil-Troubled Water,	W79-00029 5G
AIR FORCE ARMAMENT LAB., EGLIN AFB.,	W79-00169 5B	AUBURN UNIV., AL. ENGINEERING
FL. Species Diversity Indices of the Fish Popula-	AMERICAN INST. OF CHEMICAL	EXPERIMENT STATION.
tions of Streams Draining Selected Test Areas	ENGINEERS, NEW YORK.	Transpiration and Evaporation of Sewage Ef- fluent.
on Eglin Air Force Base Reservation Florida,	Water 1977.	W79-00088 5D
W79-00277	W79-00342 5D	AUSTRALIAN ATOMIC ENERGY
AIR FORCE ENVIRONMENTAL TECHNICAL	AMERICAN MUSEUM OF NATURAL	COMMISSION, LUCAS HEIGHTS, NEW
APPLICATIONS CENTER, SCOTT AFB, IL. A Technique for Estimating Clock Two-Hourly	HISTORY, PLACID, FL. ARCHBOLD BIOLOGICAL STATION.	SOUTH WALES (AUSTRALIA). ISOTOPE DIV.
Precipitation Rate Distributions,	Fish and Wildlife Inventory of the Seven-Coun-	The Isotope Hydrology of the Mercenie Sand- stone Aquifer, Alice Springs, Northern Territo-
W79-00089 2B	ty Region Included in the Central Florida	ry, Australia,
AIR PRODUCTS AND CHEMICALS, INC.,	Phosphate Industry Area-Wide Environmental Impact Study. Volumes I and II,	W79-00322 2F
ALLENTOWN, PA. (ASSIGNEE).	W79-00100 5C	AWARE, INC., NASHVILLE, TN.
Activated Sludge System with Staggered Parti-	ARGONNE NATONAL LAB. IL.	Oxygen Activated Sludge Considerations for
tion Basin, W79-00055	Quantitative Comparison of Seining and Un-	Industrial Applications, W79-00354 5D
	derwater Observation for Stream Fishery Sur-	
AIRCO INDUSTRIAL GASES DIV., MURRAY	veys, W79-00072	BARR ENGINEERING CO., MINNEAPOLIS, MN.
pH Control Systems Using Carbon Dioxide.	W12-00072	Lake Level Control and ManagementA Case
W79-00365 5D	ARIZONA STATE UNIV., TEMPE. DEPT. OF	Study, W79-00390 4A
AVABRANCA NATIVESCE MOSCOW	ZOOLOGY. Aquatic Inhabitants of a Mine Waste Stream in	
AKADEMIYA NAUK SSSR, MOSCOW. POCHVENNYI INST.	Arizona,	BARRIE TANNING LTD. (ONTARIO).
Reclamation of Meadow-Chernozem	W79-00426 5C	The Environmental Effects of Chromium in Tannery Effluents,
Solonetzes of the Kustanai Oblast, (In Rus-	ARIZONA UNIV., TUCSON. DEPT. OF	W79-00156 5C
sian), W79-00395 2G	AGRICULTURAL ECONOMICS. Natural Resource Economics: The Upsetting	BATTELLE COLUMBUS LAB., COLUMBUS, OH.
AKADEMIYA NAUK SSSR; PUSHCHINO. INST.	Discipline,	Multimedia LevelsMercury,
OF AGROCHEMISTRY AND SOIL SCIENCES. Formation of a Vermiculite Mineral from	W79-00242 6B	W79-00291 5B
Ground Water Components (In Russian),	ARIZONA UNIV., TUCSON. DEPT. OF	BATTELLE PACIFIC NORTHWEST LAB.,
W79-00382 2K	HYDROLOGY AND WATER RESOURCES. Tracing Sewage Effluent Recharge - Tucson,	RICHLAND, WA. Programmer's Manual for EXPLORE-I: A
AKADEMIYA NAUK TURKMENSKOI SSR,	Arizona, W79-00299 5A	River Basin Water Quality. Appendix C,
ASHKHABAD. INST. BOTANIKI.	3A	W79-00190 5B
Overgrowing of the Kara Kum Canal and Some Aftereffects of Introducing the White Amur	Chlorofluorocarbons as Hydrologic Tracers A	BATTELLE PACIFIC NORTHWEST LABS.,
into Water Bodies, (In Russian),	New Technology, W79-00461 5A	RICHLAND, WA. Literature Review for Explore-I: A River Basin
W79-00207 4A		Water Quality Model. Appendix A,
ALASKA UNIV., COLLEGE. GEOPHYSICAL	ARIZONA UNIV. TUCSON. DEPT. OF PLANT SCIENCES.	W79-00188 5B
INST.	Effect of Soil-Injected Ethylene on Sugarbeet	User's Manual for EXPLORE-I: A River Basin
Frazil Ice Formation: A Review, W79-00120 2C	(Beta Vulgaris L.) Yield Parameters,	Water Quality Model. Appendix B, W79-00189 5B
WATER AND THE SERVICE AND THE	W79-00296 3F	
ALBANY INTERNATIONAL CO., DEDHAM,	ARIZONA UNIV., TUSCON. DEPT. OF	A Water Quality Model for the South Platte River Basin, Documentation Report,
MA. FRL DIV. Laboratory Studies on Advanced Composite H	CHEMICAL ENGINEERING.	W79-00398 5B
F Modules for Seawater Reverse Osmosis,	Hydrolysis of Iron from Acidic Liquors, W79-00228 5D	BIGELOW LAB. FOR OCEAN SCIENCES,
W79-00300 3A		WEST BOOTHBAY HARBOR, ME.
AMERICAN COLLOID CO., SKOKIE, IL.	ARIZONA WATER RESOURCES RESEARCH CENTER, TUCSON.	Diel Cycles of Inorganic Nitrogen Uptake in a
(ASSIGNEE).	Determination of Terrestrial Albedo from	Natural Phytoplankton Population Dominated by Gonyaulax Polyedra,
Method and Composition for Preventing Water Contaminated with Industrial Waste Seeping	LANDSAT I Satellite Imagery in Photographic	W79-00210 5C
Through Soil Containing Said Water,	Form, W79-00012 7B	BOOZ-ALLEN APPLIED RESEARCH,
W79-00034 5G	THE REAL PROPERTY OF THE PARTY OF THE PARTY.	BETHESDA, MD.
AMERICAN CYANAMID CO., STAMFORD, CT.	ARKANSAS UNIV., FAYETTEVILLE. DEPT. OF BOTANY AND BACTERIOLOGY.	Tunnel Component of the Tunnel and Reser- voir Plan Proposed by the Metropolitan Sanita-
Oil/Water Separation Technology: The Options	The Effects of Heavy Metals on Algae Popula-	ry District of Greater Chicago, Lower Des
Available - Part 2,	tions in a South Central Reservoir,	Plaines Tunnel System.
W79-00158 5G	W79-00011 5C	W79-00465 5D

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BRITISH COLUMBIA UNIV., VANCOUVER.	CALIFORNIA UNIV., DAVIS. DEPT. OF LAND,	CHICAGO UNIV., IL.
DEPT. OF GEOGRAPHY.		Resource Analysis: Water and Energy as
Mass Balance Model for Calculation of Ionic		
Input Loads in Atmospheric Fallout and		W79-00453 6D
Discharge from a Mountainous Basin, W79-00332 51		CIBA-FEIGY LTD., BASEL (SWITZERLAND).
W 17-00352	CALIFORNIA UNIV., LOS ANGELES.	(ASSIGNEE).
BUREAU OF ECONOMIC ANALYSIS,	Application of Ion Exchange/Adsorption	Process for Purifying Aqueous Industrial Ef-
WASHINGTON, DC.		fluents.
Conceptual and Statistical Issues in Developin		W79-00399 SEE SEE SD
Environmental Measures - Recent U.S. Experience.	Optimal Solution to the Timing, Sequencing,	CIPA CRICY CORR ARREITY NY
W79-00232		CIBA-GEIGY CORP., ARDSLEY, NY. (ASSIGNEE).
PERIMINISTATION		Treatment of Water or Aqueous Systems,
BUREAU OF RECLAMATION, DENVER, CO.	Price, and was analysis	
LOWER COLORADO REGION.	W79-00438	on Egila Air Letter Bast Read amon Justila
Reject Stream Replacement Study. W79-00092	CALIFORNIA UNIV., SANTA BARBARA. DEPT.	COASTAL ENGINEERING RESEARCH
W79-00092	OF MATHEMATICS.	CENTER, FORT BELVOIR, VA.
BUREAU OF RECLAMATION, WASHINGTON.		Hydraulics of Great Lakes Inlets, W79-00469
DC. ECONOMICS AND PROGRAM ANALYSIS	W79-00496 8D	w 19-00469
BRANCH.	Uht Bridge Meldrife Description of the Sevent Suns.	COLOGNE UNIV. (GERMANY, F.R.)
Water and Land Resource Accomplishment	S CAMBRIDGE UNIV. (ENGLAND). DEPT. OF ENGINEERING.	BOTANISCHES INST.
1975. Summary Report. W79-00191		Photosynthesis and Carbon Metabolism in
477-30171	Flow,	Marine and Freshwater Diatoms, W79-00208
Water and Land Resource Accomplishmen	s W79-00141 2J	W79-00208
1975, Statistical Appendix I. W79-00192	CANADA CENTRE FOR INLAND WATERS,	COLORADO STATE UNIV., FORT COLLINS.
W79-00192	BURLINGTON (ONTARIO).	DEPT. OF AGRICULTURAL AND CHEMICAL
Water and Land Resource Accomplishmen		ENGINEERING.
1975, Statistical Appendix II-Finances an	A STATE OF THE PARTY OF THE PAR	Control of Furrow Infiltration by Compaction,
Physical Features.	W79-00128 2H	W79-00481 3F
W79-00193	The second secon	pil Control Structure, Control Structure
Water and Land Resource Accomplishmen	Isotopic Composition of Sulfur in Precipitation	COLORADO STATE UNIV., FORT COLLINS.
1975, Statistical Appendix IIIProject Data.	Within the Great Lakes Basin, W79-00339	Shunt Meters with Segmental Orifices,
Committee of the contract of t	F .	W79-00335
W79-00194	CANAL ELECTRIC CO., SANDWICH, MA.	mpage and a south as a south maker S
CAGLIARI UNIV. (ITALY). FACULTY OF	Case History: Ash Disposal from an Oil Fried	COLORADO UNIV., BOULDER.
MEDICINE.	Central Station,	Residential Water Conservation,
The Phosphagens of Some Protozoa as Ecolog	i- W79-00361 5E	W79-00440 3D
cal Indicators (In French), W79-00423	A CASE WESTERN RESERVE UNIV.,	COLORADO UNIV., BOULDER. DEPT. OF
W 77-00423	CLEVELAND, OH.	CIVIL ENVIRONMENTAL AND
CALGARY UNIV., ALBERTA. DEPT. OF	Numerical Computation of Three-Dimensional	ARCHITECTURAL ENGINEERING.
GEOGRAPHY.	Circulation in Lake Erie: A Comparison of a	Characterization and Treatment of Stormwater
Flood Regions in Jamaica,	Free-Surface Model and a Rigid-Lid Model,	Runoff,
W79-00330	E W79-00132 2H	W79-00005 5E
CALIFORNIA STATE DEPT. OF WATER	CENTRAL INLAND FISHERIES RESEARCH	COMMONWEALTH SCIENTIFIC AND
RESOURCES, SACRAMENTO. DIV. OF	INST., CUTTACK (INDIA). FISHERIES	INDUSTRIAL RESEARCH ORGANIZATION,
PLANNING.	RESEARCH STATION.	CANBERRA (AUSTRALIA). DIV. OF
Management Aspects of Cyclic Storage		ENVIRONMENT AL MECHANICS.
Water in Aquifer Systems,	W79-00197	Solute Transport During Absorption of Wate
W79-00386		by Soil: Laboratory Studies and their Practica
CALIFORNIA UNIV., BERKELEY.	GOTBORG (SWEDEN); AND GOTEBORG	Implications,
Solvent Extraction for Treatment of Was		W79-00472
waters from Acetic-Acid Manufacture,	ANALYTISK KEMI.	COMMONWEALTH SCIENTIFIC AND
W79-00366		INDUSTRIAL DESEADOU ORGANIZATION
CALIFORNIA UNIV., BERKELEY. DEPT. OF	Industrial Processing of Phosphorite. A Case	WEMPLY (AUSTRALIA) DIV OF
FORESTRY AND CONSERVATION.	orday in the Fractical Cat of Danie Rillowicage	MINERALOCY
Brushland Watershed Fire Management Poli	in Analytical and Marine Chemistry, W79-00151	Undergraphsmister, of a Calarate Containin
in Southern California: Biosocial Conside		Aquifer Near Lake Way, Western Australia,
tions,	CHALMERS UNIV. OF TECHNOLOGY,	W79-00323
W79-00449	GOTEBORG (SWEDEN).	
CALIFORNIA UNIV., BERKELEY, DEPT. OF	How to Utilize Steam from Thermorefiners.	EXPERIMENT STATION, NEW HAVEN.
MECHANICAL ENGINEERING.	(Hur utnyttja anga fran termoraffinoerer),	Desitableia Destada Con he Decembertal
Field Investigation of Selective Withdrawal,	W79-00418	Nitrite Broth, Santalini day leaturantee
W79-00119	A CHESAPEAKE BIOLOGICAL LAB.	W79-00498
	SOLOMONS, MD.; AND MARYLAND UNIV.,	CONNECTION TO THE COURSE
CALIFORNIA UNIV., BERKELEY. SEA WATE CONVERSION LAB.	COLUMN TIME COLUMN TO SOCIALITY	
Vapor Compression Energy Reduction by V	A Comparison by Size Class and Volume of Detritus Versus Phytoplankton in Chesapeako	
tical Tube Foam Evaporation of Scawater,	Bay,	Municipal Sewage Sludge Ash,
	3A W79-00494 21	

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CONNECTICUT UNIV., STORRS. INST. OF	DEPARTMENT OF ENVIRONMENTA	EDDE (HOWARD), INC., BELLEVUE, WA.
WATER RESOURCES. The Effect of Reduced Wetlands and Storage	CONTROL, HAARLEM (NETHERLANDS). Acid Precipitation in the Netherlands,	Process Design Investigations for Alaska Pulp Mill Wastewater Treatment Facilities,
Basins on the Size, Stability and Productivity	W79-00138	W79-00412 5D
of the Watershed Mixing Zone, W79-00441	DEPARTMENT OF HEALTH, EDUCATION	ENVIREX, INC., MILWAUKEE, WI.
War and the blesses and the second	AND WELFARE, WASHINGTON, DC.	Laboratory Study of the Release of Pesticide
CORNELL UNIV. AGRICULTURAL	(ASSIGNEE).	and PCB Materials to the Wate Column During
EXPERIMENT STATION, ITHACA, NY. DEPT.	Apparatus for Producing High-Purity Water,	Dredging and Disposal Operations,
OF AGRONOMY.	W79-00046 Interpolation automorphism and 5F	W79-00286
Microbial Degradation of DDT, W79-00278 5C	DEPARTMENT OF JUSTICE, WASHINGTON,	ENVIRO DEVELOPMENT CO., INC.,
W79-00278	DC. ANTITRUST DIV.	MOUNTAIN VIEW, CA.
CORPORATION FOR ENGINEERING,	The Demand for Clean Water: The Case of the	Dewatering of Sludges from Oil Fried Electric
GEOLOGICAL AND HYDROLOGICAL	Charles River,	Power Generating Plants,
INVESTIGATION, PRAGUE	W79-00234 6B	W79-00360 5D
(CZECHOSLOVAKIA). STAVEBNI GEOLOGIE. A Storm Rainfal Pattern Above the Central	DEPARTMENT OF SCIENTIFIC AND	ENVIRONMENTAL MONITORING AND
African Plateau,	INDUSTRIAL RESEARCH, HAVELOCK	SUPPORT LAB., CINCINNATI, OH.
W79-00126 2B	NORTH (NEW ZEALAND). SOIL BUREAU.	Analysis of Radioactive Contaminants in By-
	Field Observations of the Moisture Regime of a	Products from Coal-Fired Power Plant Opera-
CORVALLIS ENVIRONMENTAL RESEARCH	Yellow-Grey Earth (Otokia Silt Loam) in East- ern Otago,	tions,
LAB., OR.	W79-00310 2G	W79-00227 5A
Energy Consumption of Advanced Wastewater Treatment at Ely, Minnesota,	expectation of the Committee of	ENVIRONMENTAL PROTECTION AGENCY,
W79-00102 5D	DEPARTMENT OF THE ENVIRONMENT,	EDISON, NJ.
	OTTAWA (ONTARIO). MARINE SCIENCES	The Biological Effects of Toxic Material Spills,
COUNCIL FOR SCIENTIFIC AND INDUSTRIAL	DIRECTORATE. Icebreaking Capability of CCGS 'Labrador' in	W79-00344 5C
RESEARCH, PRETORIA (SOUTH AFRICA).	Western Barrow Strait, October 23-28, 1973,	BUILD ON THE STATE OF THE STATE
NATIONAL PHYSICAL RESEARCH LAB. Hailstone Size inferred from Dents in Cold-	W79-00090 2C	ENVIRONMENTAL PROTECTION AGENCY,
Rolled Aluminum Sheet,	Mulater State of the Control of the	KANSAS CITY, MO. REGION VII. Yellowstone National Park Survey May-August
W79-00139 7B	DEPARTMENT OF THE ENVIRONMENT,	1970, Includes Soda Butte Survey May-August
	READING (ENGLAND). WATER DATA UNIT.	tober 1969.
DAMES AND MOORE, DENVER, CO.	An Estimate of Annual Runoff from England and Wales, 1728-1976,	W79-00250 5A
Rainfall Frequencies for the Persian Gulf Coast	W79-00124 2E	PARTICULAR PARTICULAR PROPERTY OF THE PARTICULAR
of Iran,	SECTION TAIL	ENVIRONMENTAL PROTECTION AGENCY,
W79-00123 2B	DEPARTMENT OF THE INTERIOR,	WASHINGTON, DC. MUNICIPAL CONSTRUCTION DIV.
DELAWARE UNIV., NEWARK. DEPT OF	WASHINGTON, D. C., OFFICE OF WATER	Cost Estimates for Construction of Publicly-
ECONOMICS.	RESEARCH AND TECHNOLOGY.	Owned Treatment Facilities, 1974 'Needs' Sur-
Constraints to Welfare Gains Under Extended	Irrigation Efficiency, A Bibliography, Volume 3.	vey, Final Report to the Congress.
Jurisdiction Fisheries Management: Discussion	W79-00307 3F	W79-00248 5G
(Anderson),		ENVIRONMENTAL BROTECTION ACENCY
W79-00235 6E	DIAMOND SHAMROCK CORP.,	ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. OFFICE OF WATER
DELAWARE UNIV., NEWARK. DEPT. OF	PAINESVILLE, OH. On-Site Generation of Hypochlorite Solutions	PLANNING AND STANDARDS.
SOCIOLOGY.	by Electrolysis of Seawater,	Criteria Document for DDT.
A Comparative Study of Community Response	W79-00372 5F	W79-00276 5A
to Water Related Problems,		March temperate standal 31 antinophratic
W79-00010 6B	DU PONT DE NEMOURS (E. I.) AND CO.	Criteria Document for Toxaphene. W79-00281
DEPARTMENT OF AGRICULTURE,	WILMINGTON, DE. (ASSIGNEE).	W79-00281 5A
MINNEAPOLIS, MN. SCIENCE AND	Drip Irrigation System, W79-00038 3F	Criteria Documents for Aldrin/Dieldrin.
EDUCATION ADMINISTRATION.		W79-00282
Hydraulic Model Investigation of a Two-Way	DUNDEE UNIV. (SCOTLAND). DEPT. OF	PAUDONMENTAL PROTECTION ACRACY
Drop Inlet for Floodwater Retarding Structure	BIOLOGICAL SCIENCES.	ENVIRONMENTAL PROTECTION AGENCY, WASHINGTON, DC. SPILLS PREVENTION
No. 3, Banklick Creek Watershed, Boone and Kenton Counties, Kentucky,	Effects of Feeding and of Chemical Stimulation	AND CONTROL BOARD.
W79-00341 8B	on the Oxygen Uptake of Nassarius Reticulatus (Gastropoda: Prosobranchia),	Environmental Effects of Schuvlkill Oil Spil
	W79-00083	II. June 1972.
DEPARTMENT OF AGRICULTURE,	THE PARTY OF THE P	W79-00294 56
WASHINGTON, DC. OFFICE OF THE	ECODYNE CORP., UNION, NJ. INDUSTRIAL	ENVIRONMENTAL RESEARCH CENTER,
SECRETARY. (ASSIGNEE). Treatment of Lime-Sulfide Tannery Unhairing	WASTE TREATMENT DIV.	
Waste,	Treatment of Liquid Wastes from Fossil Fuel Power Plants,	Economic Analysis of Selected Features of
W79-00026 5D		
THE RESIDENCE OF THE PARTY OF T		Legislation,
DEPARTMENT OF ENERGY, WASHINGTON,	ECOLE NATIONALE SUPERIEURE DES	W79-00246
DC. DIV. OF BASIC ENERGY SCIENCES. Summaries of Physical Research in the	MINES DE PARIS, FONTAINEBLEAU	ENVIRONMENT AL RESEARCH LAB
Geosciences.	(FRANCE). CENTER FOR GEOLOGICAL INFORMATION.	DULUTH, MN.
W79-00101 410 410 10F		Asbestos - A Bibliography,
Low Flan VCt of Assessment VIII Styrical World World	W79-00134 2F	W79-00225
DEPARTMENT OF ENERGY, WASHINGTON,		The state of the s
DC OFFICE OF CONSERVATION AND SOLAR	ECOSYSTEMS INTERNATIONAL, INC.,	EVERGLADES NATIONAL PARK, HOMESTEAD, FL.
APPLICATIONS. The Optimal Pricing of Undepletable Externali-	GAMBRILLS, MD. Applications of Remote Sensing to Hydrologic	
tics, with the particular to and ward	Planning,	Channelized and Meandering Streams,
W79-00239 6C	W79-00099 7B	

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EXXON RESEARCH AND ENGINEERING CO., LINDEN, NJ.	FRASER COMPANIES LTD., MADAWASKA, ME.	GEOLOGICAL SURVEY, MADISON, WI. WATER RESOURCES DIV.
Removal of Ammonium Sulfide from Waste- water by Liquid Membrane Process, W79-00161	Looking at the Positive Side of Energy Regula- tion, W79-00411	Geology and Ground Water in Door County, Wisconsin, with Emphasis on Contamination Potential in the Silurian Dolomite, W79-00256 5B
FISH AND WILDLIFE SERVICE,	FUJISASH INDUSTRIES, LTD., KAWASAKI	CORDONAL ENDS: ACRUCULTURANT
ARKADELPHIA, AR. Nonmetallic Electrofishing Booms and Acces-	(JAPAN). (ASSIGNEE). Process and Apparatus for Separating Oil From	Water Resources Data for Wisconsin, Water Year 1977.
sory Tackle, W79-00069 7B	Water Contaminated with Oil,	W79-00267 TGG to a set abstract fall Crist 7C
Section Committee of the Committee of th	W79-00050 5G	GEOLOGICAL SURVEY, MENLO PARK, CA.
Collection Bucket for Use with Tow Nets for Larval Fish, W79-00070 7B	GENERAL DYNAMICS CORP., POMONA, CA. Simple Model for Ocean Outfall Plumes, W79-00479 5B	WATER RESOURCES DIV. Ground-Water Data, 1974-76, Indian Wells Valley, Kern, Inyo, and San Bernardino Counties,
FISHERIES AND MARINE SERVICE, ST. ANDREWS (NEW BRUNSWICK). BIOLOGICAL	GEOLOGICAL SURVEY, BAY ST. LOUIS, MS.	California, W79-00253
STATION. Acute and Chronic Oral Toxicity of Chl- roinated Dibenzofurans to Salmonid Fishes,	WATER RESOURCES DIV. Analysis of Flood Resulting from the Toccoa Falls, Georgia, Dam Break,	Forms of Trace Elements in Soils, Sediments, and Associated Waters: An Overview of Their Determination and Biological Availability,
W79-00062 5C	W79-00262 2E	W79-00271 5B
FLOOD AND ASSOCIATES, INC., JACKSONVILLE, FL.	Laboratory Studies of Gas Tracers for Reacra-	GEOLOGICAL SURVEY OF CANADA, OTTAWA (ONTARIO).
Comparison of Complete Mixed Activated Sludge and UNOX Treatment of Brewery	tion, W79-00270	Longitudinal Dispersion of Fluid Particles in Mountain Streams: I. Theory and Field
Wastes, W79-00348 5D	GEOLOGICAL SURVEY, DENVER, CO. WATER RESOURCES DIV.	Evidence, W79-00308 5B
FLORIDA A AND M UNIV., TALLAHASSEE.	Automated Determination of Selenium in	Longitudinal Dispersion of Fluid Particles in
Vegetative Stabilization of Dredge Spoil in North Florida,	Water, W79-00261	Mountain Streams: 2. Similarity of the Mean Motion and Its Application,
W79-00337	Water-Resources Appraisal of the Wet Moun-	W79-00309
FLORIDA ATLANTIC UNIV., BOCA RATON.	tain Valley, in Parts of Custer and Fremont	GEOLOGICAL SURVEY OF INDIA,
DEPT. OF BIOLOGICAL SCIENCES. Vegetation of Southeastern Florida Parts II	Counties, Colorado, W79-00274 4B	HYDERABAD. Electrical-Resistivity Surveys for Groundwater
V, W79-00196 21	GEOLOGICAL SURVEY, HARRISBURG, PA. WATER RESOURCES DIV.	in the Deccan Trap Country of Sangli District, Maharashtra, W79-00107
FLORIDA UNIV., BELLE GLADE. INST. FOR FOOD AND AGRICULTURAL SCIENCES.	Model of the Flooding Caused by the Failure of the Laurel Run Reservoir Dam, July 19-20,	W79-00107 4B GEOLOGICAL SURVEY, OKLAHOMA CITY,
Use of Dummy Variables in Water Resources Studies,	1977, near Johnstown, Pennsylvania, W79-00263	OK. WATER RESOURCES DIV. Low-Flow Characteristics of Oklahoma
W79-00114 2G	Water Resources Data for Pennsylvania, Water	Streams,
FLORIDA UNIV., GAINESVILLE. DEPT. OF	Year 1977Volume 2. Susquehanna and	
ENVIRONMENTAL ENGINEERING SCIENCES. Waterhyacinth (Eichhornia Crassipes) Nutrient	Potomac River Basins. W79-00265 . 7C	High-Flow Frequencies for Selected Streams in Oklahoma,
Uptake and Metabolism in a North Central Florida Marsh,	Water Resources Data for Pennsylvania, Water	W79-00273 2E
W79-00206 5C	Year 1977Volume 1. Delaware River Basin. W79-00266 7C	GEOLOGICAL SURVEY, ORLANDO, FL. WATER RESOURCES DIV.
FMC CORP., CHICAGO, IL. (ASSIGNEE). Biological Oxidation and Flotation Apparatus	Water Resources Data for Pennsylvania, Water	Potentiometric Surface Map of the Floridan Aguifer in the St. Johns River Water Manage-
and Method, was particularly and Method, was a second and the seco	Year 1977Volume 3. Ohio River and St.	ment District and Vicinity, Florida, September,
W79-00030	Lawrence River Basins. W79-00268 7C	1977, W79-00275
FOOD AND AGRICULTURAL ORGANIZATION OF THE UNITED NATIONS, ROME (ITALY).		GEOLOGICAL SURVEY, ROLLO, MO. WATER
LAND AND WATER DEVELOPMENT DIV. Shortest Path Problems in Hydrogeology.	GEOLOGICAL SURVEY, HARTFORD, CT. WATER RESOURCES DIV.	RESOURCES DIV.
W79-00137	Delta in South vietnam and Cambodia,	
FOOD AND DRUG ADMINISTRATION,	W79-00255	W79-00254
WASHINGTON, DC. DIV. OF CHEMISTRY AND PHYSICS.	GEOLOGICAL SURVEY, LINCOLN, NE. WATER RESOURCES DIV.	GEOLOGICAL SURVEY, SALT LAKE CITY, UT., WATER RESOURCES DIV.
Identification of Kepone Alteration Products in Soil and Mullet,	Ground-Water Availability in the Hitchcock-	The Historic Level of Great Salt Lake, Utah, W79-00264 2H
W79-00080 5A	Driftwood Irrigation Districts, Southwest	GEOLOGICAL SURVEY, TACOMA, WA.
FRANKLIN INST. RESEARCH LABS., PHILADELPHIA, PA. SCIENCE	Nebraska, W79-00260 4B	WATER RESOURCES DIV. Low-Flow Characteristics of Streams on the
INFORMATION SERVICES DEPT.	GEOLOGICAL SURVEY, LINCOLN, NE.	Olympic Peninsula, Washington.
Preliminary Study of Selected Potential En- vironmental Contaminants Optical	WATER RESOURCES DIV.; AND NEBRASKA	W79-00258
Brighteners, Methyl Chloroform, Tri-	UNIV. CONSERVATION AND SURVEY	GEOLOGICAL SURVEY, TALLAHASSEE, FL.
Chloroethylene, Tetrachloroethylene and ion Exchange Resins,	DIVISION, LINCOLN. Groundwater Quality Atlas of Nebraska,	WATER RESOURCES DIV. Summary of U.S. Geological Survey Investiga-
W79-00283 5A		tions and Hydrologic Conditions in the

ORGANIZATIONAL INDEX

ounty, nation 5B Water 7C CA. Is Valunties,

ments, Their

eles in Field

cles in

Mean 5B

dwater bistrict, 4B ITY, lahoma 2E eams in 2E floridan fanagetember, 7C

Scenic 5B

Utah, 2H

on the 2E E, FL.

in the

INSTITUTO NACIONAL DE LIMNOLOGIA, SANTO TOME (ARGENTINA).

Southwest Florida Water Management District for 1977,	RECREATION SERVICE, WASHINGTON, DC.	ILLINOIS UNIV. AT THE MEDICAL CENTER, CHICAGO.
W79-00272 4A	Protection of Outdoor Recreation Values of	Is Chrysotile Asbestos Released from
GEOLOGICAL SURVEY, TUCSON, AZ. WATER RESOURCES DIV.; AND BUREAU OF	Rivers. W79-00093 6B	Asbestos-Cement Pipe into Drinking Water., W79-00013
RECLAMATION, PHOENIX, AZ. ARIZONA	Public Outdoor Recreation Benefits of Federal	Determination of Chrysotile Asbestos in Rain-
DEPT. OF TRANSPORTATION, PHOENIX. Maps Showing Water-Level Declines, Land	Water Resource Projects. W79-00094 6E	water, W79-00014 5A
Subsidence, and Earth Fissures in South-Cen-	Federal Outdoor Recreation Land Acquisition-	Characterization of the Release of Chrysotile
tral Arizona, W79-00251 7C	LWCF.	Asbestos from Asbestos-Cement Drinking Water Pipe,
GEORGIA-PACIFIC CORP., PORTLAND, OR.	W79-00095	W79-00435 5B
(ASSIGNEE).	Energy Conservation and Outdoor Recreation,	Investigation of Rainwater for the Presence of
Clarification Process, W79-00041 5D	W79-00096 6G	Asbestos,
	Needs of Private for Profit Enterprises in Out-	W79-00437 5A
GESUNDHEITSINSPEKTORAT STADT ZURICH, (SWITZERLAND).	door Recreation. W79-00097 6B	ILLINOIS UNIV. AT URBANA-CHAMPAIGN DEPT. OF ZOOLOGY AND ENTOMOLOGY.
On the Vertical Distribution and Seasonal	Roles/Functions of Federal, State and Local	Uptake and FAte of DI-2-Ethylhexyl Phthalate
Development of the Density of Dreissena Polymorpha Larvae in the Pelagic Zone of the	Public Agencies.	in Aquatic Organisms and in a Model Ecosystem,
Lake of Zurich (In German),	W/9-00098	W79-00061 5B
- I wildling the state of the s	HIROSHIMA UNIV., (JAPAN). INST. OF	IMPERIAL CHEMICAL INDUSTRIES LTD.,
GOVERNMENT COLL. OF ENGINEERING	ENVIRONMENTAL CHEMISTRY. Degradation of Aqueous Phenol Solution by	LONDON (ENGLAND). (ASSIGNEE). Treatment of Solids-Liquid-Gas Mixtures.
AND TECHNOLOGY, RAIPUR (INDIA). DEPT. OF CIVIL ENGINEERING.	Gamma Irradiation,	W79-00022 5D
Air Entrainment in Radial Flow Towards In-	W79-00153 5D	INDIAN HEALTH SERVICE, PHOENIX, AZ.
takes,	HOUSTON-GALVESTON AREA COUNCIL, TX.	OFFICE OF ENVIRONMENTAL HEALTH.
W79-00315	Point Source Analysis. Inventory, Water De-	New Approach Gets Results in Utah Well, W79-00181
Vortex Formation at Vertical Pipe Intakes, W79-00485	mands, and Problem Area Identification. (Areawide Waste Treatment Plan for the	at the artiful may X has a ready both to be a figure of
W79-00485	Greater Houston Area. Section 208, PL 92-500.	INDIAN INST. OF TECH. KANPUR. DEPT. OF CIVIL ENGINEERING.
GRACE (W. R.) AND CO., COLUMBIA, MD.	W79-00104 6D	Digital Model Studies of Unsteady-State Radial
Development of Low Cost Membrane Cleaning Agents,	HOUSTON RESEARCH, INC., TX.	Flow to Partially Penetrating Wells in Unconfined Anisotropic Aquifers,
W79-00304 3A	New Technology: Ozone/UV Chemical Oxida- tion Wastewater Process for Metal Complexes,	W79-00111 2F
GULF SOUTH RESEARCH INST., NEW ORLEANS, LA.	Organic Species and Disinfection, W79-00369 5D	Type-Curve Analysis of Time-Drawdown Data for Partially Penetrating Wells in Unconfined
Pretreatment of Industrial Wastes with Ozone, W79-00368 5D	HYDROTECHNIC CORP., NEW YORK.	Anisotropic Aquifers, W79-00136 2F
GULF STATES PAPER CORP., TUSCALOOSA,	New Developments in Oil Interception by Fil- tration,	INFOTECH, TEHRAN (IRAN).
AL.	W79-00364 5D	Conjunctive Use of Ground and Surface Water,
Designing and Operating an Oxygen Activated Sludge System Including Tertiary Alum-Mud	IDAHO STATE UNIV., POCATELLO. The Source of American Falls Reservoir Pollu-	W79-00170 4B
Precipitation, W79-00350 5D	tants,	INSTITUT DES SCIENCES DE LA NATURE,
W79-00350 5D	W79-00004 5B	NANTES (FRANCE). LAB. D'ECOLOGIE ANIMALE ET BIOLOGIE MARINE.
HAGER AND ELSAESSER, STUTTGART-	IDAHO UNIV., MOSCOW.	First Ecological Data on the Oyster Ponds in
VAIHINGEN (WEST GERMANY). (ASSIGNEE). Process for the Treatment of Water Solution by	A Pilot Plant Trial for Ozone Sterilization of	the Bay of Bourgneuf (In French), W79-00295
Ion Exchange,	Fish Hatchery Water, W79-00455 5G	Party as Watchiever Beach Tree Section
W79-00054 5F		INSTITUT PASTEUR, PARIS (FRANCE). Chemical Inhibitors of Plant Transpiration: IV.
HARBOR BRANCH FOUNDATION, INC., FORT	ILLINOIS STATE GEOLOGICAL SURVEY, URBANA; AND ILLINOIS STATE WATER	Action of Alar-85, (In French),
PIERCE, FL.	SURVEY, URBANA.	W79-00247 · · · 2D
A Comparison of Ceramic and Teflon in Situ Samplers for Pore Water Determinations,	Geologic Studies to Identify the Source for	INSTITUTE OF HYDROLOGY,
W79-00325 5A	High Levels of Radium and Barium in Illinois Ground-Water Supplies: A Preliminary Report,	WALLINGFORD (ENGLAND). Solid State Event Recorder for Rainfall Mea-
HARVARD UNIV., CAMBRIDGE, MA. DIV. OF	W79-00003	surement, W79-00125 2B
ENGINEERING AND APPLIED PHYSICS.	ILLINOIS STATE WATER SURVEY, URBANA.	ANNAL WATER AND DESCRIPTION OF THE PARK A SHARE A
Studies in Microbial Chemotactic Behavior in Seawater.	Climatology of Instantaneous Rainfall Rates, W79-00327	INSTITUTE OF OCEAN SCIENCES, SIDNEY
W79-00293	A company of the community of the company	(BRITISH COLUMBIA). FROZEN SEA RESEARCH GROUP.
		Mixing in an Arctic Fjord,
SHANGER SHANKEN AND PARK SHALL WAS DONE	Relation Between the St. Louis Urban	
HELSINKI UNIV. OF TECHNOLOGY, OTANIEMI (FINLAND). LAB. OF WOOD	Relation Between the St. Louis Urban Precipitation Anomaly and Synoptic Weather Factors,	W79-00487 2L
HELSINKI UNIV. OF TECHNOLOGY, OTANIEMI (FINLAND). LAB. OF WOOD CHEMISTRY.	Precipitation Anomaly and Synoptic Weather Factors. W79-00328	W79-00487 2L INSTITUTO NACIONAL DE LIMNOLOGIA,
HELSINKI UNIV. OF TECHNOLOGY, OTANIEMI (FINLAND). LAB. OF WOOD CHEMISTRY. Characterization of Spent Bleaching Liquors.	Precipitation Anomaly and Synoptic Weather Factors. W79-00328	W79-00487 INSTITUTO NACIONAL DE LIMNOLOGIA, SANTO TOME (A RGENTINA).
HELSINKI UNIV. OF TECHNOLOGY, OTANIEMI (FINLAND). LAB. OF WOOD CHEMISTRY.	Precipitation Anomaly and Synoptic Weather Factors. W79-00328 2B Optimal Operation of Shelbyville and Carlyle Lakes,	W79-00487 2L INSTITUTO NACIONAL DE LIMNOLOGIA,

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Sample collection Up to Commencement of Counting, (In Spanish),	MAKHACHKALA (USSR). DAGESTANSKII DIV.	LONG ISLAND LIGHTING CO., GLENWOOD LANDING, NY.
W79-00385 5A	Nutrition and Growth of the Bighead Aristichthys Nobilis (Rich.) In Bodies of Water	Waste Treatment for a Profit, W79-00359
INTERMOUNTAIN FOREST AND RANGE EXPERIMENT STATION, OGDEN, UT.	of the Dagestan ASSR,	LOUISIANA STATE UNIV., BATON ROUGE,
Hydrochemical Influences on the Fishery	Imaha to a lead drutes all months hadon	COASTAL STUDIES INST.
Within the Phosphate Mining Area of Eastern	KENTUCKY UNIVERSITY, LEXINGTON,	Inertial Currents Over the Inner Shelf Near 30
Idaho, W79-00427	WATER RESOURCES RESEARCH INSTITUTE.	Degree N.
SHEET TO SEE STATE OF THE SECOND SEES OF THE SECOND SECO	Influence of Nitrogen Fertilization on the Quality and Quantity of Streamflow from a	W79-00133
Rearing of Chinook Salmon in Tributaries of	Forested Watershed,	LUND INST. OF TECH. (SWEDEN). DEPT. OF
the South Fork Salmon River, Idaho, W79-00428	W79-00448 5B	WATER RESOURCES ENGINEERING.
W 77-00426	Kennya Ciran majura ad Onici ta para a sa	Stochastic Processes in Water Resources En-
INTERNATIONAL PAPER CO., MOBILE, AL.	KENTUCKY WATER RESOURCES RESEARCH INST., LEXINGTON.	gincering.
The Closed Mill Concept,	Organized Resistance to an Imposed Environ-	W79-00380
W79-00420 3E	mental Change. A Reservoir in Eastern Ken-	LUND UNIV. (SWEDEN). DEPT. OF ANIMAL
INTERNATIONAL REFERENCE GROUP ON	tucky,	ECOLOGY.
GREAT LAKES POLLUTION FROM LAND USE	W79-00142 6B	Diversity and Environments of Benthic Inver-
ACTIVITIES. Environmental Management Strategy for the	KIEL UNIV. (WEST GERMANY). INST. FUER	tebrate Communities in South Swedish
Great Lakes System.	MEEREKUNDE.	Streams, W79-00209 5C
W79-00084 5G	Studies on the Pathways and Effects of Cadmi-	West State of the State of the State of the
DUNGSTER CONTRACTOR SECTION AND ADDRESS OF THE ADDR	um in Controlled Ecosystem Enclosures,	LUND UNIV. (SWEDEN). DEPT. OF
IONICS, INC., WATERTOWN, MA.	W79-00066 CRIVING INTA LANGERT 5B	ECOLOGICAL BOTANY.
High Temperature Eletrodialysis-Phase VI, W79-00303	KOCHI UNIV. (JAPAN).	Wet Meadows in Southern Sweden: Vegeta-
W 17-00303	Biologically Active Substances in Pulping	tion, Succession and Management (In Swedish),
IOWA AGRICULTURAL AND HOME	Waste Liquors. I. Substances Active Against	W79-00288 21
ECONOMICS EXPERIMENT STATION, AMES.	Termites, Coptotermes Formosanus Shiraki, in	Marriage Triagen To Marriagy W. 1887 Mayer
Profile Accumulation of Fertilizer-Derived Nitrate and Total Nitrogen Recovery in Two	Kraft Pulping and Bleaching Wastes,	MAINE COOPERATIVE FISHERY RESEARCH
Long-Term Nitrogen-Rate Experiments with	W79-00404 5D	UNIT, ORONO.
Corn,	KRAFT, INC., GLENVIEW, IL.	Stamina Tunnel Tests on Hatchery-Reared At- lantic Salmon.
W79-00500 2G	Effect of Whey Application on Chemical Pro-	W79-00075
IOWA UNIV., IOWA CITY. DIV. OF ENERGY	perties of Soils and Crops,	
ENGINEERING; AND IOWA UNIV., IOWA	W79-00363 5E	MAINE UNIV. AT ORONO.
CITY. DIV. OF RESEARCH ENGINEERING.	KRASNOYARSK STATE UNIV. (USSR).	Nutrient Loading/Lake Trophic Condition
Wet Cooling Tower Backfitting Economics,	Effect of Sulfur Deficiency on Water Regime	Relationships with Special Reference to the In-
W79-00233 5G	and Intensity of Pea and Wheat Photosynthes-	fluence of Flushing Rate, W79-00001 5C
JOHNS HOPKINS UNIV., BALTIMORE, MD.	is, (In Russian),	DECWASTRACTION RECEIVING AND ADDRESS.
MCCOLLUM-PRATT INST.; AND JOHNS	W79-00200 2I	MASSACHUSETTS INST. OF TECH.
HOPKINS UNIV., BALTIMORE, MD. DEPT. OF	KYOTO UNIV. (JAPAN). DISASTER	CAMBRIDGE. Destruction of Trace Toxic Compounds in
BIOLOGY. Annual Subsurface Transport of a Red Tide	PREVENTION RESEARCH INST.	Water and Sludge by Ionizing Radiation,
Dinoflagellate to its Bloom Area: Water Circu-	Mechanical Characteristics of Debris Flow,	W79-00370 5D
lation Patterns and Organism Distributions in	W79-00117	Consideration of the Constitution of the Const
the Chesapeake Bay,	PUOTO UNIV. (IABAN) PACIII TV OP	MASSACHUSETTS INST. OF TECH.,
W79-00317	KYOTO UNIV. (JAPAN). FACULTY OF AGRICULTURE.	CAMBRIDGE. DEPT. OF CIVIL ENGINEERING.
KAISER ENGINEERS OAKLAND, CA.	Rational Determination of Underdrainage	Influence of Strip Mines on Regional Ground
Final Report on Field Test Evaluation and	System from the Hydraulic Point of View: Stu-	Water Flow,
Operation and Maintenance of Seawater	dies on Underdrainage of Clayey Paddy Soil:	W79-00118 50
Reverse Osmosis and Electrodialysis Pilot	III. (In Japanese),	MCGILL UNIV., MONTREAL (QUEBEC).
Plants at Wrightsville Beach Test Facility, November 1976.	W79-60199 2G	DEPT. OF BIOLOGY.
W79-00302 3A	LAFAYETTE COLL., EASTON, PA. DEPT. OF	
LAND AND SEATING MENTALISMS AND RESIDENCE	CHEMISTRY.	Seepage,
KANSAS UNIV. SPACE TECHNOLOGY	Manual of Analytical Quality Control for Pesti-	W79-00489 5I
CENTER, LAWRENCE. REMOTE SENSING	cides and Related Compounds in Human and	MEDICAL ACADEMY, LODZ (POLAND).
Agricultural and Hydrological Applications of	Environmental Samples, W79-00287	Biological Evaluation of Acute Toxicity o
Radar: Final Report,	THE LAND AL SERVICE PROPERTY.	Selected Finishing Agents (Biologiczna ocen
W79-00464 7B	LITTLE (ARTHUR D.), INC., CAMBRIDGE,	toksyczności ostrej wybranych srodkow
KANSAS WATER RESOURCES RESEARCH	MA. ALTON YAYA MARTAN MENTRE PARTELLA	pomocniczych),
INST., MANHATTAN.	Economic Impacts of Pulp and Paper Industry	W79-00413
Factors Controlling Variations in River Water	Compliance with Environmental Regulations. Volume I. Summary and Aggregate Industry	MET-PRO SYSTEMS, INC., LANSDALE, PA.
Quality in Kansas,	Impact Analyses.	(ASSIGNEE).
W79-00006 5B	W79-00430 6E	Carbon Contact Column,
Nitrate Reductase Activity of Soybeans in	LOCKWOOD ANDREWS AND MENNAME	W79-00028
Relation to other Indicators of Water Stress,	LOCKWOOD, ANDREWS AND NEWNAM,	MIAMI UNIV., CORAL GABLES, FL.
W79-00149	INC., HOUSTON, TX. Dynamics and Control of Suspended Solids in a	Cattails (Typha Spp.)Weed Problem or Poten
KASPIISKII NAUCHNO-ISSLEDOVATELSKII	Two-Step Activated Sludge Plant,	tial Crop.,
INST. RYBNOGO KHOZYAISTVA,	W79-00352 5D	W79-00198

ORGANIZATIONAL INDEX NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, MIAMI, FL. ATLANTIC

MICHICAN STATUTINIV DAST LANSING	MISSAUBLUNIV COLUMBIA SCHOOL OF	
MICHIGAN STATE UNIV., EAST LANSING. DEPT. OF BOTANY. An Investigation of Primary Production and	MISSOURI UNIVCOLUMBIA. SCHOOL OF FORESTRY, FISHERIES AND WILDLIFE. A Note on Effects of Sewage Effluent Irriga-	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION, WASHINGTON, DC. (ASSIGNEE).
Ecosystem Metabolism in a Lake Michigan	tion on Specific Gravity and Growth Rate of	Remote Water Monitoring System.
Dunc Pond, W79-00205	White and Red Oaks, W79-00425	W79-00047
MICHIGAN STATE UNIV., EAST LANSING.	MITSUBISHI ELECTRIC MFG. CO. LTD.,	NATIONAL COUNCIL OF PAPER INDUSTRY FOR AIR AND STREAM IMPROVEMENT,
DEPT. OF RESOURCE DEVELOPMENT. Summary of Study Findings, Phase I Report:	AMAGASAKI (JAPAN). Apparatus for Deploying and Taking Up an Oil	INC., NEW YORK. Investigation of Factors Affecting BOD Measurement and Experience with the 1-Day BOD
Ecological Effects of Highway Construction Upon Michigan Woodlots and Wetlands, W79-00195 4C	Fence, W79-00048 5G	Test, W79-00405
ABAMMAN CHANNEL WASHINGTON	MO DO MEKAN, LONDON(ONTARIO).	NATIONAL COUNCIL OF THE PAPER
MICHIGAN UNIV., ANN ARBOR. DEPT. OF APPLIED MECHANICS AND ENGINEERING SCIENCE.	Nekoosa Cleans Condensates with Steam Distillation, W79-00162 5D	INDUSTRY FOR AIR AND STREAM IMPROVEMENT, INC., NEW YORK.
Pipe Sizes from Modified Moody Diagram, W79-00499 3F	MONTANA STATE UNIV., BOZEMAN. DEPT. OF BIOLOGY.	Bioassay Results of Kraft Mill Effluent at Ar- tificially Elevated Levels of Biosolids, W79-00406 5C
MICHIGAN UNIV., ANN ARBOR. DIV. OF	Growth and Dicts of Trout from Contrasting	A Study of the Fate of Biosolids from Biologi-
BIOLOGICAL SCIENCES. Morphometric Changes in Asterionella For-	Environments in a Geothermally Heated Stream: The Firehole River of Yellowstone Na-	cally Treated Effluent in Laboratory and Con- structed Streams,
mosa Colonies Under Phosphate and Silicate Limitation,	tional Park, W79-00082 5C	W79-00407 5C
W79-00215	MONTEDISON S.P.A., MILAN (ITALY).	NATIONAL INST. OF AGRICULTURAL
MICHIGAN UNIV., ANN ARBOR. SEA GRANT	(ASSIGNEE).	ENGINEERING, SILSOE (ENGLAND). The Application of Linear Programming to
PROGRAM.	Process for Removing Mercury and Mercury	Run-Off Management,
The Determination of Quantity and Quality of Great Lakes United States Shoreline Eroded	Salts from Liquid Effluents, W79-00056 5D	W79-00393
Material,	MOSCOW STATE UNIV. (USSR), DEPT. OF	NATIONAL MARINE FISHERIES SERVICE,
W79-00249 5B MILAN UNIV. (ITALY). LAB. DI ZOOLOGIA.	SOIL PHYSICS AND RECLAMATION. Possible Use of Polymeric Materials for Fortifi-	AUKE BAY, AK. AUKE BAY FISHERIES LAB. Simple Venturi Device for Mixing Freshwater and Seawater in an Estuarine Culture System,
The Toxicity of Manganese Ethylenebisdithic-	cation of Drainage Fills (In Russian),	W79-00071 7B
carbamate to the Adult Newt, Triturus	W79-00439 4A	NATIONAL MARINE FISHERIES SERVICE, LA
Cristatus, W79-00064 5C	MOSCOW STATE UNIV. (USSR). RESEARCH	JOLLA, CA.
PROMINE UAND READE USES COMME	LAB. OF SOIL EROSION. Methodical Problems in the Evaluation and	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management,
MILLIPORE CORP., BEDFORD, MA. Molecular Fractionation by Staged Ultrafiltra-	Mapping of Erosion-Endangered Lands (In Russian),	W79-00240 6E
tion, W79-00367 5D	W79-00462 2J	NATIONAL MARINE FISHERIES SERVICE, SEATTLE, WA. NORTHWEST AND ALASKA
MINISTRY OF AGRICULTURE, FISHERIES	MOSKOVSKAYA	FISHERIES CENTER.
AND FOOD, LOWESTOFT (ENGLAND). FISHERIES RADIOBIOLOGICAL LAB.	SEL'SKOKHOZYAISTVENNAYA AKADEMIYA (USSR). DIV. OF MEADOW SCIENCE. A Lysimetric Study of Waters in an Irrigated	Constraints to Welfare Gains Under Extended Jurisdiction Fisheries Management: Discussion, W79-00231 6B
Transuranic Nuclides in Plaice (Pleuronectes Platessa) from the North-Eastern Irish Sea,	Pasture (In Russian),	NATIONAL OCEAN SURVEY, ROCKVILLE,
W79-00077 5B	W79-00284 2G	MD.
MINISTRY OF RECLAMATION AND WATER	MUNICIPAL ENVIRONMENTAL RESEARCH	The Vertical Planar Motion Mechanism; A Dynamic Test Apparatus for Evaluating Cur-
MANAGEMENT, MOSCOW (USSR). Efficiency of Screenless Wells for Irrigation,	RESEARCH DIV. Ion Selective Electrodes in Water Quality Anal-	rent Meters and Other Marine Instrumentation, W79-00224 7B
W79-00184 3F	ysis,	NATIONAL OCEANIC AND ATMOSPHERIC
MINISTRY OF WORKS AND DEVELOPMENT	W79-00223 5A	ADMINISTRATION, ANN ARBOR, MI. GREAT
CHRISTCHURCH (NEW ZEALAND). WATER AND SOIL RESEARCH.	NALCO CHEMICAL CO., OAK BROOK, IL. (ASSIGNEE).	LAKES ENVIRONMENTAL RESEARCH LAB. Lake Superior Regulation Effects,
Origin and Transport of Large Boulders in	Color Removal Process,	W79-00388 4C
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The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 BRemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, 1. Tracer Studies,	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson ;1. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE.	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 BD OREGON STATE UNIV., CORVALLIS, DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 5E A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 4C NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 5D Removal of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 5D NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson; I. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 BD OREGON STATE UNIV., CORVALLIS, DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister.
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 Bemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies, W79-00115 2E	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson :1. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 8D OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dunge-
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 BRemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, 1. Tracer Studies, W79-00115 2E NEW SOUTH WALES UNIV., KENSINGTON	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson; I. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 8D OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister, W79-00065 5C
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 Bemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies, W79-00115 2E	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson :1. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 BD OREGON STATE UNIV., CORVALLIS, DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister.
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 BRemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies, W79-00115 PENEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies, W79-00115 A Field Evaluation of Subsurface and Surface New South Wales Univ., Kensington (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson ; I. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity, W79-00285 SA NORTHWESTERN UNIV., EVANSTON, IL. Characterization of Performance of Full-Scale	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 8D OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister, W79-00065 OTTAWA UNIV. (ONTARIO). DEPT. OF EPIDEMIOLOGY AND COMMUNITY MEDICINE.
The Feasibility of Using Forest Lands for Recycling Sludge Nutrients in Northern New England, W79-00446 A Model for Evaluating Alternative Land Developments Around Lakes, W79-00460 AC NEW JERSEY INST. OF TECH., NEWARK. Sorption Capabilities of Various Materials for Leachate Treatment, W79-00377 Bemoval of Fluoborate from Plating Wastewater: Technique and Mecahnism, W79-00378 SD NEW SOUTH WALES, KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING. A Field Evaluation of Subsurface and Surface Runoff, I. Tracer Studies, W79-00115 NEW SOUTH WALES UNIV., KENSINGTON (AUSTRALIA). SCHOOL OF CIVIL ENGINEERING.	NORTH CAROLINA STATE UNIV., RALEIGH. DEPT. OF BIOLOGICAL AND AGRICULTURAL ENGINEERING. Pretreatment Land Application of Textile Plant Wastes, W79-00362 SE NORTH CENTRAL FOREST EXPERIMENT STATION, ST. PAUL, MN. Survival and Early Growth of Selected Trees on Waste Water Application Sites, W79-00422 SE NORTH DAKOTA STATE UNIV., FARGO. Membrane Concentration of Infectious Bovine Rhinotracheitis Virus from Water, W79-00148 SC NORTH DAKOTA STATE UNIV., FARGO. DEPT. OF VETERINARY SCIENCE. B. R. /Hanson; I. A. /Schipper W79-00150 SC NORTHERN ARIZONA UNIV. FLAGSTAFF. DEPT. OF BIOLOGICAL SCIENCE. A Periphytic Microflora Analysis of the Colorado River and Major Tributaries in Grand Canyon and Vicinity, W79-00285 SA NORTHWESTERN UNIV., EVANSTON, IL.	Inland Ice Sheet Thinning Due to Holocene Warmth, W79-00340 OJI PAPER CO. LTD., (TOKYO) JAPAN. The Radiation-Induced Degradation of Lignin in Aqueous Solutions, W79-00164 ONTARIO MINISTRY OF THE ENVIRONMENT, TORONTO. Deflection of P.V.C. Pipe Under Burial Conditions, W79-00103 8D OREGON STATE UNIV., CORVALLIS. DEPT. OF AGRICULTURAL AND RESOURCE ECONOMICS. Distributional Implications of the Extended Economic Zone: Some Policy and Research Issues in the Fishery: Discussion, W79-00238 OREGON STATE UNIV., NEWPORT. DEPT. OF FISHERIES AND WILDLIFE. Toxicity of the Fungicide Captan to the Dungeness Crab Cancer Magister, W79-00065 OTTAWA UNIV. (ONTARIO). DEPT. OF EPIDEMIOLOGY AND COMMUNITY

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OXFORD UNIV., (ENGLAND). DEPT. OF GEOLOGY AND MINERALOGY.		PROCTER AND GAMBLE CO., CINCINNATI,
GEOLOGY AND MINERALOGY. Bedforms and Their Hydraulic Stability Rela-	Instrumentation and Controls for Philadelphia Electric Company Eddystone Generating Sta-	OH. EPA's Goal for Suspended Solids is Not Me
tionships in a Tidal Environment, Bay of	tion Wastewater Treatment System,	with Media Filtration
Fundy, Canada,	W79-00357 5D	W79-00414
W79-00336 2L	KIND CASHENDA MANAMAN MATANGEN MEDING	
TECHNICAL CAIN, OF ISTAURIDE CURERY	PITTSBURG UNIV., PA. DEPT. OF CIVIL	PUNJAB AGRICULTURAL UNIV., LUDHIANA
PAPUA NEW GUINEA UNIV., PORT MORESBY	ENGINEERING.	(INDIA). DEPT. OF CIVIL ENGINEERING.
(NEW GUINEA). DEPT. OF GEOGRAPHY. Potential and Limitations of Rainfall-Runoff	Three-Dimensional Open Channel Flow, W79-00312	Pollution of Groundwater Through Nonlinea
	THE CAMERINE WAS ARREST THROUGH	Diffusion, W79-00110
Models for Prediction on Ungauged Catchments: A Case Study from the Papua	PITTSBURGH UNIV., PA. DEPT. OF CIVIL	W 72-00110 Language Polymonth Eliw Systemolic St
New Guinea Highlands,	ENGINEERING.	PURDUE UNIV., LAFAYETTE, IN.
W79-00491 2A	Stream Temperature Estimation Using Kalman	AGRICULTURAL EXPERIMENT STATION.
MANAGER STATES CHESTIC STREET	Filter, THAS WALLES AND AND AND	A Soil Moisture Budget Model Accounting for
PENNSYLVANIA DEPT. OF ENVIRONMENTAL	W79-00121	Shallow Water Table Influences,
RESOURCES, HARRISBURG. BUREAU OF	POLISH ACADEMY OF SCIENCE, KRAKOW.	W79-00473
WATER QUALITY MANAGEMENT. Data Base System for State Water Quality	ZAKLAD BIOLOGII WOD.	PURDUE UNIV., LAFAYETTE, IN. SCHOOL O
Management Information System.	Biocenosis of a High Mountain Stream Under	CIVIL ENGINEERING.
W79-00222 5G	the influence of Tourism. 4. The Bottom Fauna	Operating Model for the Green River Basi
- WALKER SHIP MENNE LILI SASSESS THEFT	of the Stream Rybi Potok (The High Tatra	Reservoir System,
PENNSYLVANIA STATE UNIV., UNIVERSITY	Mts), desiran an trad to stacknown Ab	W79-00452
PARK.	W79-00221	RADIAN CORP., AUSTIN, TX.
On the Environmental Efficiency of Economic	POLISH ACADEMY OF SCIENCES, KRAKOW.	Biological Effects and Environmental Aspec
Systems, Thank and Thank Loop Parkers	ZAKLAD BIOLOGII WOD.	of 1,3-Butadiene,
W79-00230 6G	Biocenosis of a High Mountain Stream Under	W79-00292
A Mathematical Model for Simulating Water	the Influence of Tourism. 3. Attached Algae	Count of Menance Chart, some French by the
Demand-Supply and Energy Uses for the State	Communities in the Stream Rybi Potok (The	RAMLIT ASSOCIATES, BERKELEY, CA.
of Pennsylvania,	High Tatra Mts, Poland) Polluted with	Continuous Simulation of Nonpoint Pollution,
W79-00442 8A	Domestic Sewage, W79-00220	W79-00493
First Lieuten C HO nau't Nation	W79-00220 5C	RESEARCH CORP. OF NEW ENGLAND,
PENNSYLVANIA STATE UNIV., UNIVERSITY	POLISH ACADEMY OF SCIENCES, KRAKOW.	WETHERSFIELD, CT.
PARK. CENTER FOR AIR ENVIRONMENT	ZAKLAD BIOLOII WOD.	Sampling and Modeling of Non-Point Source
STUDIES.	Benthic Algae in a Pond After the Accumula-	at a Coal-Fired Utility,
Transfer of Gases at Natural Air-Water Inter-	tion of Beet-Sugar Factory Wastes,	W79-00279
faces, W79-00127 2L	W79-00216 5C	
W79-00127	Phytophilous Fauna in Ponds Fertilized with	Modeling and Monitoring of Toxic Spills at
PENNSYLVANIA STATE UNIV., UNIVERSITY	Sugar Factory Wastes,	Toxic Effluents, W79-00343
PARK. DEPT. OF BIOLOGY.	W79-00217 5C	W 77-00343
Genetic and Environmental Factors Involved in	collect the street, and the street to the	Management Plan for Control and Treatment
Increased Resistance of Brook Trout to Sul-	Biocenosis of a High Mountain Stream Under	Toxic Substances,
furic Acid Solutions and Mine Acid Polluted	the Influence of Tourism. 1. Chemism of the	W79-00346
Waters, Market M	Rybi Potok Waters and the Chlorophyll Con-	Wastewater Odor Problem Solving Proce
W79-00458 5C	tent in Attached Algae and Seston in Relation	Modification Versus Air Treatment,
PENNSYLVANIA STATE UNIV., UNIVERSITY	to the Pollution, W79-00218	W79-00373
PARK. DEPT. OF INDUSTRIAL AND	11 12-00218	United of Academical Dy Alice and Mississipple
MANAGEMENT SYSTEMS ENGINEERING.	Biocenosis of a High Mountain Stream Under	RESEARCH-COTTRELL, INC., BOUND
Water/Energy Management and Evaluation	the Influence of Tourism. 2. Bacteria as an	BROOK, NJ.
Model for Pennsylvania,	Index of Water Pollution on the Rybi Potok	Collecting Bark Burner Ash with Electrostat
W79-00007 6D	Stream,	Precipitators, W79-00163
	W79-00219 5C	M 13-00163
PERMUTIT CO., INC., PRINCETON, NJ.	POLISH ACADEMY OF SCIENCES, POZNAN	RESEARCH COUNCIL OF ALBERTA,
RESEARCH AND DEVELOPMENT CENTER. Increased Product Water Recovery by Reverse	(POLAND). INST. OF APPLIED ZOOLOGY.	EDMONTON.
Osmosis Using Interstage Ion Exchange Soft-	Ecology of Dreissena Polymorpha (Pall.)	Hydrogeology of the Grande Prairie Area, A
ing and a Spiractor,	(Dreissenidae, Bivalvia) in Lakes Receiving	berta, at Manual Manual Miles and Manual Miles
W79-00301 3A	Heated Water Discharges,	W79-00470
	W79-00068 5C	RESEARCH INST. OF FORESTS AND
PETROLITE CORP., ST. LOUIS, MO.	POLYBAC CORP., NEW YORK.	RANGELANDS, TEHRAN (IRAN).
Factors Influencing Induced Air Flotation,	Controlling and Monitoring Activated-Sludge	Water Harvesting for Afforestation: I. Efficie
W79-00375 5D	Units.	cy and Life Span of Asphalt Cover,
PETROLITE CORP., ST. LOUIS, MO.	W79-00160 5D	W79-00474
(ASSIGNEE).	BRINGSTON HAIV AL PERT OF CIVIT	Water Harvestine for Affaronation W. C.
Employing Methylene Phosphonates of Oxyal-	PRINCETON UNIV., NJ. DEPT. OF CIVIL	Water Harvesting for Afforestation: II. Su vival and Growth of Trees,
kylated Polyalkylene Polyamines in Chelation	ENGINEERING. A New Finite Element Technique for the Solu-	W79-00475
and/or Scale Inhibition,	tion of Two-Phase Flow Through Porous	A STATE OF STREET STREET STATE
W79-00052 5F		RHODE ISLAND UNIV., KINGSTON, DEPT. O
OHERER ATTROUT A TRAINAR SERVICE	Media, W79-00135	RESOURCE ECONOMICS.
PETROLITE CORP., ST. LOUIS, MO.	EUSTON, SIA.	Distributional Implications of Extended Fish
Critical Applysis of Electrican Berformance	Dynamic Programming and the Principle of Op-	ries Jurisdiction: Some Research and Policy
Critical Analysis of Flotation Performance, W79-00376 5D	timality: A Systematic Approach, W79-00396 6A	sues: Discussion, W79-00237
177-00376 SD	11 / 2-00370 DA	

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RIDER COLL., TRENTON, NJ. DEPT. OF BIOLOGY. Growth, Mortality, and Biomass Partitioning in	Method for Depolluting Fresh and Sea Water from Petroleum Products,	OSAKA (JAPAN). (ASSIGNEE). Method of Disposing of Waste Water Contain-
Freshwater Tidal Wetland Populations of Wild Rice (Zizania Aquatica Var. Aquatica),	W79-00058	ing Emulsified Oil, W79-00020 5D
W79-00214 5C	SOUTH AUSTRALIA DEPT. OF MINES,	47V-86336
RIJKSINSTITUUT VOOR DRINKWATER- VOORZIENING, LEIDSCHENDAM (NETHERLANDS).	ADELAIDE. A Novel Method of Estimating the Discharge of Water from Mound Springs of the Great Ar-	TECHNICAL UNIV. OF ISTANBUL (TURKEY). DEPT. OF HYDRALIC AND WATER POWER. Scour of Bed Material in Very Rough Chan-
Continuous Standard Water Delivery System for Bioassays with Aquatic Organisms,	tesian Basin, Central Australia, W79-00112 2F	nels, W79-00122
W79-00073	SOUTH CAROLINA UNIV., COLUMBIA. DEPT.	TECHNISCHE HOCHSCHULE, DARMSTADT
ROCKY MOUNTAIN FOREST AND RANGE EXPERIMENT STATION, FORT COLLINS, CO. Grazing and Logging Effects on Soil Surface	OF GEOLOGY; AND SOUTH CAROLINA UNIV., COLUMBIA. BELLE W. BARUCH INST. FOR MARINE BIOLOGY AND COASTAL RESEARCH.	(WEST GERMANY). INST FUER MAKROMOLEKULARE CHEMIE. On the Removal of Lignosulfonates and Car-
Changes in Central Colorado's Ponderosa Pine Type,	Bathymetry as an Indicator of Net Circulation	bohydrates from Sulfite Pulp Wash Waters with Activated Carbon (Zur Entfernung von
W79-00140 4C	in Well Mixed Estuaries, W79-00488	Ligninsulfonaten und Kohlenhydraten aus Sul- fitzellstoff-Waschwaessern mittels Aktivkohle),
ROHM AND HAAS CO., PHILADELPHIA, PA. (ASSIGNEE).	SOUTHERN ILLINOIS UNIV. AT	W79-00410 5D
Desalination Process Using Thermally	CARBONDALE, IL. DEPT. OF BOTANY.	TECHNISCHE HOGESCHOOL, DELFT
Regenerable Resins, W79-00057	Our Reclamation Future: The Missing Bet on Trees,	(NETHERLANDS). DEPT. OF CIVIL
Biological Effects and Naviconder R. Aspects	W79-00086	ENGINEERING; AND TECHNISCHE HOGESCHOOL, DELFT (NETHERLANDS).
ROHM AND HAAS KENTUCKY INC., LOUISVILLE, KY.	SOUTHERN ILLINOIS UNIVERSITY,	LAB. OF FLUID MECHANICS.
Control of Nuisance Odors from Ponds by the	CARBONDALE, DEPARTMENT OF CHEMISTRY AND BIOCHEMISTRY.	Internal Fronts in Two-Layer Flo, W79-00486
Use of Bacteria Cultures, W79-00374 5D	Evaluation of Donnan Dialysis for the En-	Domand-Surjety and Strate feet thorships
ROYAL NETHERLANDS METEOROLOGICAL	richment of Cations, W79-00434	TENCO HYDRO/AEROSCIENCES, INC., COUNTRYSIDE, IL. (ASSIGNEE).
INST., DE BILT (NETHERLANDS).		Belt Type Oil Removal Unit,
A Simple Model for Shallow Lake Evapora- tion,	STANFORD RESEARCH INST., MENLO PARK, CA.	W79-00040 5G
W79-00326 2D	Research to Anticipate Environmental Impacts	TENNESSEE TECHNOLOGICAL UNIV.,
SACHS-SYSTEMTECHNIK G.M.B.H.,	of Changing Resource Usage. W79-00085 6G	COOKEVILLE. A Comparative In Vitro Study of the Effects of
SCHWEINFURT (WEST GERMANY). Battery Operated Water Purification System,	STATE UNIV. OF NEW YORK AT ALBANY.	Various Balanced Saline Solutions on Respira-
W79-00043 5F	ATMOSPHERIC SCIENCES RESEARCH	tion Rates of Liver Tissues of Three Fish Spe- cies,
SARATOV AGRICULTURAL INST. (USSR).	CENTER. Seven Problems in Bubble and Jet Drop	W79-00454 5C
Growth Aspects of Green Ash Seedlings in Years Varying in Moisture (In Russian),	Researchers, the Mark All E a to store book	TENNESSEE TECHNOLOGICAL UNIV.,
W79-00018 21	W79-00319 8B	COOKEVILLE. DEPT. OF CIVIL ENGINEERING.
SAVANNAH RIVER ECOLOGY LAB., AIKEN,	STATE UNIV. OF NEW YORK AT ALBANY. DEPT. OF ATMOSPHERIC SCIENCE.	Development of a Manometric Fish Bioassay
SC. Uptake of Americum-241 by Algae and Bac-	Electric Rainfall Intensity Sensor, W79-00329 2B	Technique for Water Pollution, W79-00008 5A
teria,	Morganic of a High Morreson Toron Closer	TENNESSEE TECHNOLOGICAL UNIV.,
W79-00067	STATE UNIV. OF NEW YORK AT ALBANY. SCHOOL OF BUSINESS.	COOKVILLE. DEPT. OF BIOLOGY.
SCIENCE AND EDUCATION ADMINISTRATION, TEMPLE, TX.	Modeling for Organizational Decision-Making:	Artificial Substrate Sampler for Benthic Inver- tebrates in Ponds, Small Lakes, and Reser-
GRASSLAND-FORAGE RESEARCH CENTER.	Profits vs. Social Values in Resource Manage- ment,	voirs,
Scepage Control by Particle Size Selection, W79-00484	W79-00243	W79-00074 7B
SCIENCE AND EDUCATION	STATE UNIV. OF NEW YORK AT FREDONIA.	TENNESSEE UNIV., KNOXVILLE. DEPT. OF
ADMINISTRATION, WASHINGTON, DC.	ENVIRONMENTAL RESOURCES CENTER. Phytoplankton Extracellular Release and Rs	CIVIL ENGINEERING. Stormwater Modeling,
Soil, Water and Air Sciences Research. W79-00105	Relation to the Seasonal Cycle of Dissolved Or-	W79-00381 5B
SCRIPPS INSTITUTION OF OCEANOGRAPHY,	ganic Carbon in a Eutrophic Lake, W79-00213	Regionalization of Stormwater Response for
SAN DIEGO, CA. VISIBILITY LAB.	STATE UNIV. OF NEW YORK AT SYRACUSE.	the Tennessee Valley Using the Lag Modulus Concept,
Optical Classification of Natural Waters, W79-00318 2L	COLL. OF ENVIRONMENTAL SCIENCE AND	W79-00447 5G
SERVICIO NACIONAL DE AGUAS	FORESTRY. Effects of Municipal Sewage Effluent Irriga-	Factors Affecting the Quality of Urban Runoff
SUBTERRANEOUS, SAN JOSE (COSTA RICA).	tion on the Trace Metal Content of	in Four Watersheds Within the City of Knox-
A Digital Model of Part of the Rio Tempisque Alluvial Aquifer, Costa Rica,	Earthworms, W79-00009 5C	wille, Tennessee, W79-00456
W79-00311 2F	STONE AND WEBSTER ENGINEERING CORP.,	TENNESSEE VALLEY AUTHORITY,
SEVERN-TRENT WATER AUTHORITY,	BOSTON, MA.	CHATTANOOGA.
BIRMINGHAM (ENGLAND). Simulation of Flows in Ungaged Basins,	Design Considerations for Wastewater Treat- ment Systems at Existing Fossil Power Plants.	Use of Wastewater Treatment Ponds at TVA Fossil Fueled Power Plants,
W79-00331 2E	W79-00358 Existing Possil Power Plants,	W79-00356

tain-

Y). R. han-

2J)T

Caraters von Sulble), 5D

RATE AD

8B

5G

cts of spira-Spe-

5C

assay 5A

Inver-Reser-7B OF

se for odulus 5G Runoff Knox-

TVA

		AND REPORTED THE PERSON OF THE	AND RESERVE OF PERSONS AND ASSESSMENT OF
TENNESSEE VALLEY AUTHORITY,		ULSTER COLL. NORTHERN IRELAND	A Procaryotic Intracellular Symbiont of the
CHATTANOOGA. DIV. OF ENVIRONME	NTAL	POLYTECHNIC, JORDANSTOWN.	Great Salt Lake Brine Shrimp Artemia Salina
PLANNING.	0 Tub	Momentum Transfer in a Compound Channel,	(I), W79-00298 2H
Removal of Complex Copper-Ammoni from Aqueous Wastes with Fly Ash.	ia lons	W79-00334 8B	W79-00298
W79-00155	5D	UNION CARBIDE CORP., SISTERSVILLE, WV.	UTAH WATER RESEARCH LAB., LOGAN.
	N. H. LECK	UNOX Wastewater Treatment System Per-	WASOPT Users Manual: An Integer Pro-
TERECO CORP., COLLEGE STATION, T	X.	formance Silicone Chemical Complex.	gramming Methodology for Municipal/Regional
(ASSIGNEE).		W79-00349 5D	Water Supply Planning.
Aquatic Biotal Monitor,		UNION CARBIDE CORP., SOUTH	W79-00002 6A
W79-00033	5A	CHARLESTON, WV.	Preliminary Identification of the Salt Pick-up
TEXAS A AND I UNIV., KINGSVILLE. DI	EPT.	The UNOX Process: Effective Wastewater	and Transport Processes in the Price River
OF CIVIL AND MECHANICAL ENGINEE		Treatment Practice,	Basin, Utah.
Water Well Development Decisions.		W79-00347	W79-00145 3C
W79-00167	8B	NAME OF THE OWN HOLD W.	VALMET OY, JYVASKYLA (FINLAND).
979-40013 1.5		UNIVERSAL OIL PRODUCTS, INC., SAINT	Analyses of Paper Machine Waters with Ion
TEXAS A AND M UNIV., COLLEGE STA	TION.	PAUL, MN. JOHNSON DIV.	Specific Electrodes. Part IV. Sulfate Deter-
DEPT. OF SOIL AND CROP SCIENCES.		Water Usage Requires Planning, W79-00183	mination. Using Pb(2+) Ion Specific Electrode
Water Relations of Fritted Clays, W79-00476	241	W 12-00163 S. 11 Hall of the state of the St	and Various measurement Methods,
W /9-004/6	2G	UNIVERSIDAD NACIONAL AUTONOMA DE	W79-00429 5A
TEXAS A AND M UNIV., GALVESTON, I	DEPT.	MEXICO, MEXICO CITY, DEPT. OF	VERSAR, INC., SPRINGFIELD, VA.
OF MARINE SCIENCES.	1000	INGENIERA.	A First Order Mass Balance Model for the
The Toxicity of Phthalates to the	Marine	Eddy Production Inside Wall Layers,	Sources Distribution and Fate of PCBs in the
Dinoflagellate Gymnodinium Breve,		W79-00333	Environment,
W79-00063	- 5C	INVESTIGATION AL AUTONOMA DE	W79-00289 5B
		UNIVERSIDAD NACIONAL AUTONOMA DE MEXICO, MEXICO CITY. INST. DI BIOLOGIA.	
TEXAS TECH UNIV., LUBBOCK. DEPT.	OF	Study of the Fishes of the Lagoon of Alvarado,	Assessment of the Environmental Impacts on
MICROBIOLOGY.		Warrant Marie W. C. at his	the Ban on Imports of PCBs.
A Method of Measuring Bacterial Gr		W79-00079 2L	W79-00290
Aquatic Environments Using Dialysis C		W ANGELOW	VICTORIA UNIV. (BRITISH COLUMBIA).
W79-00109	. 5A	UNIVERSITY OF MANCHESTER INST. OF	DEPT. OF GEOGRAPHY.
TEXAS TECH UNIV., LUBBOCK. DEPT.	OF	SCIENCE AND TECHNOLOGY (ENGLAND).	Water Administration in England and Wales
PLANT AND SOIL SCIENCE.	Or	DEPT OF CIVIL AND STRUCTURAL	Impacts of Reorganization,
Stomatal and Nonstomatal Regulation of	of Water	ENGINEERING.	W79-00384 . 6E
Use in Cotton, Corn and Sorghum,	, water	Pressure Fluctuations Beneath Submerged	The state of the s
W79-00016	21	Jump,	VIRGINIA HIGHWAY AND
1979-00019 12	10 1001	W79-00316 8B	TRANSPORTATION RESEARCH COUNCIL, CHARLOTTESVILLE.
Water Relations and Physiological Act	tivity of	UNIVERSITY OF NEW ENGLAND, ARMIDALE	Water Reuse at Highway Rest Areas: Evalua-
Potatoes,		(AUSTRALIA). DEPT. OF GEOGRAPHY.	tion Phase,
W79-00017	. 21	Local Differences in the Patterns of Variability	W79-00087
TEXAS UNIV. AT AUSTIN, PORT ARAN		of Tropical Rainfall: Some Characteristics and	
PORT ARANSAS MARINE LAB.	SAS.	Implications,	VIRGINIA POLYTECHNIC INSTITUTE AND
The Effect of Naphthalene on Survival	and Ac-	W79-00113 2B	STATE UNIVERSITY, BLACKSBURG, VA.
tivity of the Amphipod Parhyale,	and Ac-	WOODSHALE CORT HOLD WORTH, T.S	AGRICULTURAL ENGINEERING
W79-00081	5C	UNIVERSITY OF SOUTH FLORIDA, TAMPA.	A Model for Evaluating the Effect of Land
Manager 11	-	DEPT. OF BIOLOGY.	Uses on Flood Flows,
THESSALONIKI UNIV., SALONIKA (GR	REECE).	The Photosynthetic and Respiratory Rates and Tolerances of Benthic Algae from a Mangrove	W79-00450 4C
FACULTY OF TECHNOLOGY.		and Salt Marsh Estuary: A Comparative Study,	analysis Jenesonicanicanicania). In manufactura
On the Two-Dimensional Groundwate	r Move-	W79-00204	VYSKUMNY USTAV RASTLINNEJ VYROBY,
ment,	NE PERSON	Ellow outfavoragemental Particological Discovery	PIESTANY (CZECHOSLOVAKIA).
W79-00108	2F	UNIVERSITY OF SOUTHERN MISSISSIPPI,	Relationships Among Some Physical Properties
TIFLIS INST. OF FORESTRY (USSR).		HATTIESBURG. COLL. OF BUSINESS	of Soil (In Slovenian).
Changes in Water Regime of Brown	n Forest	ADMINISTRATION.	W79-00451 2G
Soils of the Georgian SSR Under the I		A Study of Coastal Pollution and Agency Inter-	WARSAW UNIV. (POLAND). DEPT. OF
Silvicultural Practices, (In Russian).		face,	ENVIRONMENTAL MICROBIOLOGY.
W79-00401	4C	W79-00389 5G	The Effect of Cyclohexane Derivatives or
		UNIVERSITY OF WEST FLORIDA,	Selection of Bacterial Groups Forming Ac-
TOKYO UNIV., TOKYO (JAPAN).		PENSACOLA. FACULTY OF BIOLOGY.	tivated Sludge Microflora.
Sludge Treatment by Supersonic Jet-Fl		Toxicity of Sodium Pentachlorophenate (NA-	W79-00159 5E
W79-00403	5E	PCP) to the Grass Shrimp, Palaemonetes Pugio,	WASHINGTON STATE UNIV., PULLMAN.
TORO CO., SAN MARCOS, CA. (ASSIG	NEED	at Different Stages of the Molt Cycle,	DEPT. OF ZOOLOGY.
Angularity Sensor Means for Center		W79-00078 5C	Impacts of Impoundment to Vertebrate
rigation System,	. Ivot II.	UPPSALA UNIV. (SWEDEN). INST. OF	Animals and their Habitats in the Snake River
W79-00023	3F	ZOOPHYSIOLOGY.	Canyon, Washington,
W N 1005K SC 1 (2 () -1	18 79 28	Adaptations and Resistance to Anoxia in	W79-00146 60
TSENTRALNYI GOSUDARSTVENNYI		Cloeon Dipterum (Ephemeroptera) and Nemou-	WASHINGTON UNIV., SEATTLE.
NAUCHNO-ISSLEDOVATELSKII INST.		ra Cinerea (Plecoptera).	The Development of the Electrical Powe
OZERNOGO I RECHNOGO RYBNOGO		W79-00076 5G	System in the Pacific Northwest, A Public Pol
KHOZYAISTVA, BAKU (USSR). AZERB	AIJAN		icy Perspective.
BRANCH.	107.19 (10)	UTAH STATE UNIV., LOGAN. DEPT. OF	W79-00143
Survival and Oxygen Consumption of		BIOLOGY.	the species,
Kura Carp Under Various Keeping Co	onditions	Report of a Dematiaceous Hyphomycete from	Regional Electric Energy Planning: A Case
(In Russian),		the Great Salt Lake, Utah, W79-00297 2H	Study in the Politics of Scarce Resources. W79-00144 61
W79-00180	2H	w 19-00291	H /7-00144 01

AND SAFE OF STREET YOU OF A POST ATTAM

TRANSPORT OF AN ARTON AND REST IN THE ARTON AND ARTON AN

Party of the Control of the Control

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Aquatic Festivant and Amazina Cultura van

Water for duce rand office (all district out

TEXAS UNIV. AT ACSTIN, YOUT KHANSAS. VOLT LEASTNAMARERED NOW IN THERE

A CHARLES NO PROBLEM OF A CHARLES OF A CHARL

WASHINGTON UNIV., SEATTLE. DEPT. OF CIVIL ENGINEERS.	Steam Stripping Reduce Condensate at Weyco
Climate Change: Detection and Its Impact on	Mill a catherine Toutsfer in a catheric special line
Hydrologic Design, W79-00492 2E	W79-00409 3E. WISCONSIN UNIVMADISON, CENTER FOR
WASHINGTON UNIV., SEATTLE. DEPT. OF	RESOURCE POLICY STUDIES.
OCEANOGRAPHY. Continuous Culture of Marine Diatoms Under	Property Rules, Liability Rules, and Environ- mental Economics,
Silicon Limitation. 3. A Model of Si-Limited	W79-00241 6E
Diatom Growth,	WISCONSIN UNIVMADISON, DEPT. OF
W79-00229	AGRICULTURAL ECONOMICS.
WASHINGTON UNIV., SEATTLE. FISHERIES RESEARCH INST.	Distributional Implications of the Extended Economic Zone: Some Policy and Research Is-
Seasonal Changes in Respiratory Enzyme Ac-	sucs in the Fishery,
tivity and Productivity in Lake Washington	W79-00236 6E
Microplankton, W79-00212 5C	WISCONSIN UNIVMADISON, DEPT. OF
WASTE RESEARCH UNIT, OXON (ENGLAND).	METEOROLOGY. On Geostrophic Adjustment in Sea Straits and
HARWELL LAB.	Wide Estuaries. Part I: One-Layer System,
Adsorption of Some Toxic Substances by Waste Components,	W79-00131
W79-00152 5B	WISCONSIN UNIVMADISON. DEPT. OF
WATER POLLUTION RESEARCH LAB.,	METEOROLOGY; AND WISCONSIN UNIV MADISON. MARINE STUDIES CENTER.
STEVENAGE (ENGLAND). Textile Waste Waters: Treatment and Environ-	On Geostrophic Adjustment in Sea Straits and Wide Estuaries: Theory and Laboratory Ex-
mental Effects,	periments. Part II - Two-Layer System,
W79-00166 3E	W79-00497
WATERLOO UNIV. (ONTARIO). DEPT. OF GEOGRAPHY.	WISCONSIN UNIVMADISON, DEPT. OF SOIL SCIENCE.
An Analysis of Criticisms of International	Steady Infiltration from Single and Periodic
Fishery Organizations with Reference to Three Agencies Associated with the Canadian West	Strip Sources, W79-00471
Coast Fishery, W79-00394 6E	WOLLONGONG UNIV. (AUSTRALIA). DEPT.
	OF CHEMISTRY.
WATERLOO UNIV. (ONTARIO), DEPT. OF SYSTEMS DESIGN.	Recovery of Tin from Electroplating Solutions and Rinse Waters.
A General Two Dimensional River Simulator, W79-00397 2E	W79-00157
Total Phanes	WOOD (WILLIAM S.) AND ASSOCIATES,
WEST VIRGINIA UNIV., MORGANTOWN. Studies of Ion Exchange and Chelation Com-	WEST CHESTER, PA. Safety Aspects of Toxic and Hazardous Spills,
pounds Adsorbed on Granular Graphite,	W79-00345 5G
W79-00431	WOODBINE CORP., FORT WORTH, TX.
Continuous Electrochemical Synthesis Using a	(ASSIGNEE).
Packed Granular Electrode, W79-00432 5D	Stabilization of Earth Subsurface Layers, W79-00035 8D
Distribution of Heterotrophic and Nitrifying	YAROSLAVSKII GOSUDARSTVENNYI
Bacteria Within the Aerobic-Media Trickling	PEDAGOGICHESKII INST. (USSR).
Filter. W79-00433 5D	Effect of Environmental Factors on the Dis- tribution of Caddis Fly Larvae in Small Rivers
Recovery of Sanitary-Indicator Bacteria from	(In Russian), Add and the Date of the Control of th
Streams Containing Acid Mine Water, W79-00444	W79-00147
SAMEDOWN NEW MICHOSPOLUTE	
Aerobic Media Trickling Filter Applied to Nitrogen Control,	CONTRACTOR TAX BEING DECKNESS TO THE TAX OF THE
W79-00445 5D	PROBACOL AT LATE OF BUILDING
A Study for Improving the Aerobic-Media	
Trickling Filter,	at Different Young Che State oncine has per-
W79-00457	STATE OF THE STATE
WEST VIRGINIA UNIV., MORGANTOWN.	OULOG 2 THE SECTION OF THE SECTION O
DEPT. OF CHEMICAL ENGINEERING. Total Phosphorus Transport During Storm	SUOPERINDINGS.
Events,	Color Profession and Resident of Colors
W79-00478	
WESTERN ILLINOIS UNIV., MACOMB.	ATLANTON DE LA
Musculium Transversum in the Illinois River and an Acute Potassium Bioassay Method for	THE THE PROPERTY OF THE PROPERTY OF THE PARTY OF THE PART
the Species,	ERTC - 11A
W79-00413 5C	POSION SESSIONES Y MARK ASPELLATION OF THE PERSON

ACCESSION NUMBER INDEX

*******			******				****						
W79-00001	5C			2I.			W79-00157	5D			W79-00235	6E	
W79-00002	6A		W79-00080	5A	1.4%	121 12	W79-00158	5G			W79-00236	61	
W79-00003	5A		W79-00081	5C		FIGURE 6	W79-00159	5D			W79-00237		
									1.1			6E	
W79-00004	5B		W79-00082	5C			W79-00160	5D			W79-00238	6F	
W79-00005	5B		W79-00083	5C	1.		W79-00161	5D			W79-00239	60	
W79-00006	5B		W79-00084	5G		13/10/07							
							W79-00162	5D	- 64"		W79-00240	61	
W79-00007	6D		W79-00085	6G			W79-00163	5D			W79-00241	61	
W79-00008	5A		W79-00086	4C									
							W79-00164	5D			W79-00242	61	3
W79-00009	5C		W79-00087	5D			W79-00165	5D			W79-00243	6/	A
W79-00010	6B		W79-00088	5D		THE PARTY	W79-00166	3E			W79-00244	60	
	5C					For the second							
W79-00011			W79-00089	2B			W79-00167	8B			W79-00245	50	. 3
W79-00012	7B		W79-00090	2C			W79-00168	8G -		Arginina in	W79-00246	50	
W79-00013	5A		W79-00091			LA CONTRACTOR							
				8G			W79-00169	5B			W79-00247	21	
W79-00014	5A		W79-00092	3A			W79-00170	48			W79-00248	-56	G
W79-00015	3A		W79-00093	6B			W79-00171	SC -			W79-00249	51	13
		ALL STREET, ST								STHERE I			
W79-00016	21		W79-00094	6E			W79-00172	5G			W79-00250	5.	A
W79-00017	21		W79-00095	6E			W79-00173	8C			W79-00251	76	(
						11 m							
W79-00018	21		W79-00096	6G			W79-00174	8C			W79-00252	70	
W79-00019	5F		W79-00097	6B			W79-00175	8B			W79-00253	7	C
W79-00020	5D		W79-00098										
				6E		4	W79-00176	5F			W79-00254	5	
W79-00021	5G		W79-00099	7B			W79-00177	8B			W79-00255	7	C
W79-00022	5D		W79-00100	5C				8C					В
						and the second	W79-00178				W79-00256		
W79-00023	3F		W79-00101	10F			W79-00179	5F			W79-00257	2	E
W79-00024	5D		W79-00102	5D			W79-00180	2H			W79-00258	2	E
W79-00025	5G		W79-00103	8D			W79-00181	8B			W79-00259	- 7	C
W79-00026	5D		W79-00104	6D			W79-00182	8C			W79-00260	.1	В
W79-00027	5F		W79-00105	2G			W79-00183	6D			W79-00261	.5	A
W79-00028	5D		W79-00106	10C			W79-00184	3F			W79-00262	2	E
W79-00029	5G		W79-00107	4B			W79-00185	8G			W79-00263	-	E -
W79-00030	5D		W79-00108	2F			W79-00186	8G			W79-00264	2	H
W79-00031	3F		W79-00109										
				5A			W79-00187	21		THE LINE SHE	W79-00265		C
W79-00032	3F		W79-00110	5B			W79-00188	5B		111111111111111111111111111111111111111	W79-00266	7	7C
W79-00033	5A		W79-00111	2F				5B					7C
							W79-00189				W79-00267		
W79-00034	5G		W79-00112	2F			W79-00190	5B			W79-00268	7	7C
W79-00035	8D		W79-00113	2B			W79-00191	3F			W79-00269	- 1	2G
W79-00036	5G		W79-00114	2G			W79-00192	3F			W79-00270		SA
W79-00037	4B		W79-00115	2E			W79-00193	3F			W79-00271	4	5B
W79-00038	3F		W79-00116	2E			W79-00194	3F			W79-00272	4	4A
W79-00039	5F		W79-00117	2.5			W79-00195	4C			W79-00273		2E
W79-00040			W79-00118	5G			W79-00196	21			W79-00274	4	4B
W79-00041	5D		W79-00119	4A			W79-00197	4A			W79-00275		7C
W79-00042		the state of the later											
			W79-00120	2C			W79-00198	21			W79-00276		5A
W79-00043	5F		W79-00121	5B			W79-00199	2G			W79-00277	1	7C
W79-00044													
	-		W79-00122	2J			W79-00200	21			W79-00278		5C
W79-00045	5F		W79-00123	2B			W79-00201	6G			W79-00279)	5B
W79-00046	5F		W79-00124	2E			W79-00202	21			W79-00280		5F
W79-00047	7B		W79-00125	2B			W79-00203	2G		1.50	W79-00281	1	5A
W79-00048	5G		W79-00126	2B			W79-00204	5C			W79-00282		5A
W79-00049	4B		W79-00127	2L			W79-00205	5C			W79-00283	,	5A
W79-00050	5G		W79-00128	2H			W79-00206	5C			W79-00284	1	2G
W79-00051	5A		W79-00129	2L			W79-00207	4A			W79-00285	,	5A
W79-00052	5F		W79-00130	2L			W79-00208	5C			W79-00286	5	5A
W79-00053				2L				5C					
W /9-00033			W79-00131				W79-00209				W79-00287		5A
W79-00054	5F		W79-00132	2H			W79-00210	5C			W79-00288	3	21
W79-00055			W79-00133	2L			W79-00211	5C			W79-00289		5B
W79-00056	5D		W79-00134	2F			W79-00212				W79-00290		5G
W79-00057	3A		W79-00135	2F			W79-00213	5C			W79-0029	1	5B
W79-00058			W79-00136	2F			W79-00214				W79-00293		5C
W79-00059	3F		W79-00137	6A			W79-00215	5C			W79-00293	3	5C
W79-00060			W79-00138				W79-00216				W79-0029-		5C
W79-00061	5B		W79-00139	7B			W79-00217	5C		10	W79-0029:	5	21.
W79-00062			W79-00140				W79-00218				W79-00296		3F
44.00.00000													
W79-00063	3 5C		W79-00141	21			W79-00219	5C			W79-0029	1	2H
W79-0006-	1 5C		W79-00142	6B			W79-00220	5C			W79-00298	K	2H
W79-00065			W79-00143				W79-00221				W79-0029		5A
W79-00066	5 5B		W79-00144	6E			W79-00222	5G			W79-0030	0	3A
W79-00067			W79-00145				W79-00223				W79-0030		3A
W79-00068	5 5C		W79-00146	6G			W79-00224	7B			W79-0030	2	3A
W79-00069			W79-00147				W79-00225				W79-0030		3A
W79-00070) 7B		W79-00148	5C			W79-00226	5G			W79-0030	4	3A
W79-00071			W79-00149				W79-00227				W79-0030		5A
W79-0007:			W79-00150	SC.			W79-00228				W79-0030		5D
W79-00073	3 5A		W79-00151	5G			W79-00229	5C			W79-0030	7	3F
W79-0007-			W79-00152				W79-00230				W79-0030		5B
W79-0007	5 81		W79-00153	5D			W79-00231	6B			W79-0030	4	5B
W79-00076							W79-00233				W79-0031		2G
			W79-00154							Of main 1 to			
W79-0007	7 5B		W79-00155	5D			W79-00233	5G			W79-0031	1	2F
W79-00078			W79-00156				W79-0023-				W79-0031		88
								1743					

CHARLES

CONTROL

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W79-00313	8A		W79-00392	4A	
W79-00314	8B		W79-00393	4A	
W79-00315	8B		W79-00394	6E	
W79-00316 W79-00317	8B SC	TE COLUMN	W79-00395 W79-00396	2G 6A	
W79-00318	21.		W79-00397	2E	
W79-00319	88		W79-00398	5B	
W79-00320	211		W79-00399	5D	
W79-00321	5A		W79-00400	3E	
W79-00322	2F		W79-00401	4C	DERING PURPOSE
W79-00323 W79-00324	2F 2L		W79-00402 W79-00403	5D 5E	
W79-00325	5A	OUTBOAL BY	W79-00404	5D	PUTTO AND IN
W79-00326	21)		W79-00405	5A	
W79-00327	2B		W79-00406	5C	
W79-00328	2B		W79-00407	5C	
W79-00329 W79-00330	2B 2E		W79-00408 W79-00409	3E	
W79-00330	2E		W79-00409 W79-00410	3E 5D	
W79-00332	5B		W79-00411	3E	
W79-00333	8B		W79-00412	51)	
W79-00334	8B		W79-00413	5C	
W79-00335	3F		W79-00414	5D	
W79-00336	21.		W79-00415	5A	
W79-00337 W79-00338	5G		W79-00416	5D	
W79-00338 W79-00339	21.		W79-00417 W79-00418	5A 3E	
W79-00339	2C		W79-00418	5D	
W79-00341	8B		W79-00420	3E	
W79-00342	51)		W79-00421	5D	
W79-00343	5B		W79-00422	5E	
W79-00344	5C		W79-00423	5A	
W79-00345	SG	ALCOHOLD STATE	W79-00424	5D	
W79-00346 W79-00347	5G 5D		W79-00425 W79-00426	5E 5C	
W79-00348	51)		W79-00427	5C	
W79-00349	51)		W79-00428	81	
W79-00350	5D		W79-00429	5A	
W79-00351	5D		W79-00430	6E	
W79-00352	5D		W79-00431	5D	
W79-00353 W79-00354	5D		W79-00432	5D	
W79-00354 W79-00355	5D 5D		W79-00433 W79-00434	5D 5A	
W79-00356	51)		W79-00435	5B	
W79-00357	SD		W79-00436	18	
W79-00358	51)		W79-00437	5A	
W79-00359	5D		W79-00438	6A	
W79-00360	5D		W79-00439	4A	
W79-00361 W79-00362	5E 5E		W79-00440 W79-00441	3D 2L	
W79-00363	5E		W79-00441	8A	
W79-00364	5D		W79-00443		
W79-00365	51)		W79-00444		
W79-00366	5D		W79-00445	5D	
W79-00367	5D		W79-00446	-	
W79-00368 W79-00369	SD SD		W79-00447		
W79-00370	5D		W79-00448 W79-00449		
W79-00371	5D		W79-00450		
W79-00372	51		W79-00451	2G	
W79-00373	51)		W79-00452		
W79-00374	5D		W79-00453		
W79-00375 W79-00376	5D		W79-00454		
W79-00376	5D 5D		W79-00455 W79-00456		
W79-00378	5D		W79-00457		
W79-00379	5B		W79-00458		
W79-00380			W79-00459	5B	
W79-00381	5B		W79-00460		
W79-00382	2K				
W79-00383 W79-00384	6E				
W79-00385	5A		11/20 00 16 1		
W79-00386	48		W79-00465		
W79-00387	5F		*******		
W79-00388			W79-00467	8D	
W79-00389			W 79-00468		
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W79-00391	5B			2F	

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ABSTRACT SOURCES

SOU	RCE	ACCESSION NUMBER	TOTAL
A.	CENTERS OF COMPETENCE		
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12	University of North Carolina, Metropolitan Water Resources Planning and Management	W79-0019100194	4
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ABSTRACT SOURCES

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